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VEGETATION AND SOILS OF THE COILS CREEK WATERSHED

Wilbert H. Blackburn, Richard E. Eckert, Jr., Paul T. Tueller



Agricultural Experiment Station
Max C. Fleischmann College of Agriculture
University of Nevada Reno
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VEGETATION AND SOILS
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COILS CREEK WATERSHED

Wilbert H. Blackburn^{1/}, Richard E. Eckert, Jr.^{2/}
and
Paul T. Tueller^{3/}.

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- ^{1/} Junior Range Ecologist, Nevada Agricultural Experiment Station,
University of Nevada, Reno.
- ^{2/} Range Scientist, Crops Research Division, Agricultural Research
Service, U. S. Dept. of Agriculture, Reno.
- ^{3/} Associate Range Ecologist, Nevada Agricultural Experiment Station,
University of Nevada, Reno.

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INTRODUCTION

The Coils Creek Watershed is located in Eureka County about 32 airline miles northwest of Eureka, Nevada (Fig. 1). It is bounded on the west by the Simpson Park Mountains and on the east by the Red Hills. U. S. Highway 50 is 20 miles to the south. The 3-Bar Ranch headquarters is within the watershed.

The basin is in the Battle Mountain District of the Bureau of Land Management. It consists of approximately 30,720 acres (48 square miles) of public domain except for some private land owned by the 3-Bar Ranch. There is some recent mining activity in the watershed.

The watershed lies within the central part of the Basin and Range Physiographic Province and consists of north-south trending mountains separated by valleys (Hunt, 1967). The altitude of the highest peak is around 8400 feet and the basin outlet is approximately 6500 feet. Relief between the mountains and adjoining valleys rarely exceeds 1900 feet.

Geologic parent materials consist mainly of quartzite, slate, basalt and alluvium, with some sandstone, dolomite and shale.

Water in the basin flows briefly in ephemeral streams from snow melt or thunderstorms. The drainage is south to Kobeh Valley. A number of perennial springs are found in the watershed.

The climate of the watershed is semi-arid. Annual precipitation for a 4-year period (1964 through 1968) ranged from 8.8 to 14.8 inches. Comparisons with known records at Eureka and Austin indicated 2 years below and 2 above normal precipitation. There was 2.4 inches of precipitation recorded in November with more than 1.0 inch recorded in December, April, June, July and September (Fig. 2).

During the period 1888 to 1967, the approximate temperatures ranged from a low of -26°F to a high of 110°F with the average annual temperature of 47.4°F .

Two vegetative zones are represented in the watershed. These are northern desert shrub and pinyon-juniper. Soils are Mollisols and Aridisols.

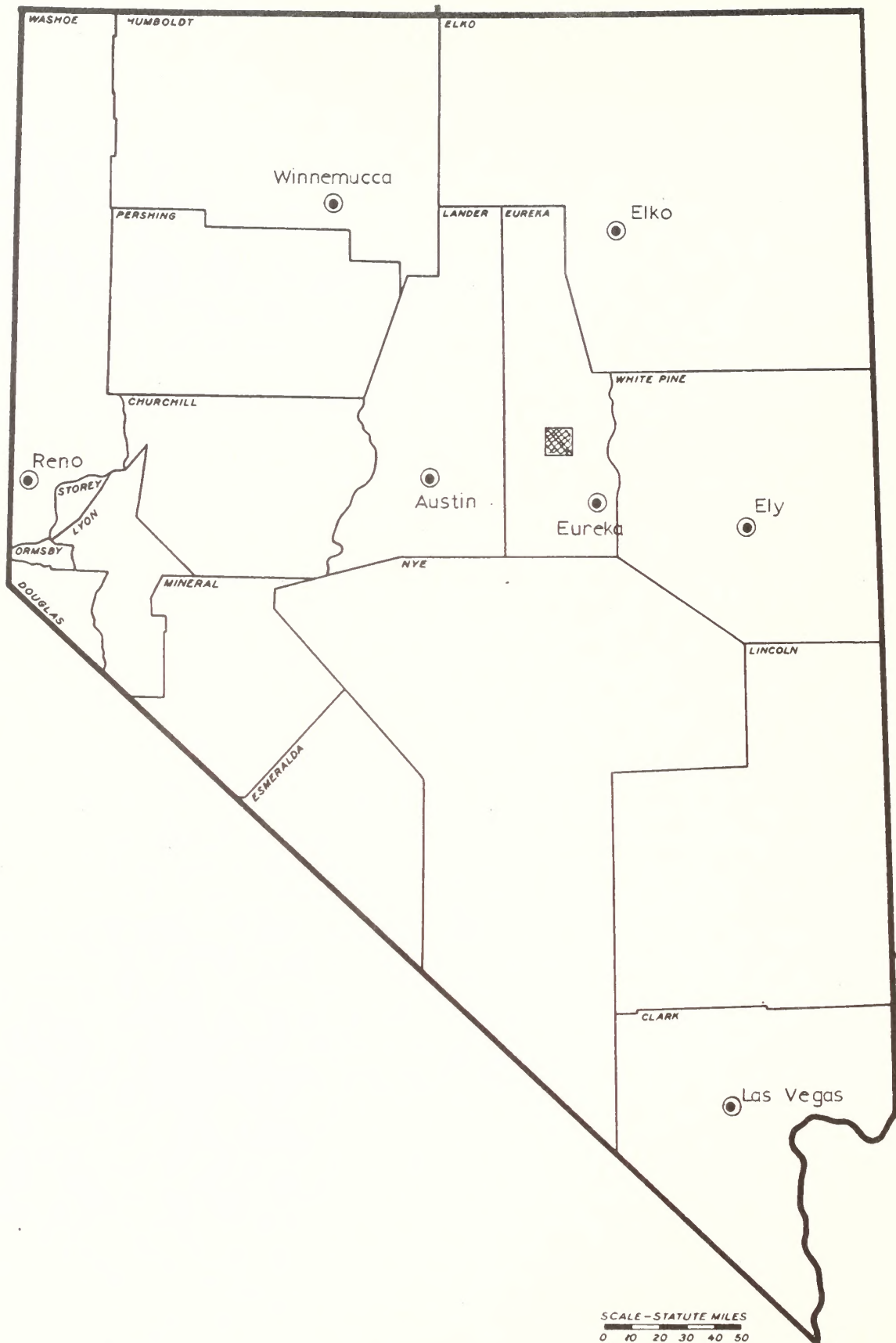


Figure 1.  Location Of The Coils Creek Watershed In Nevada

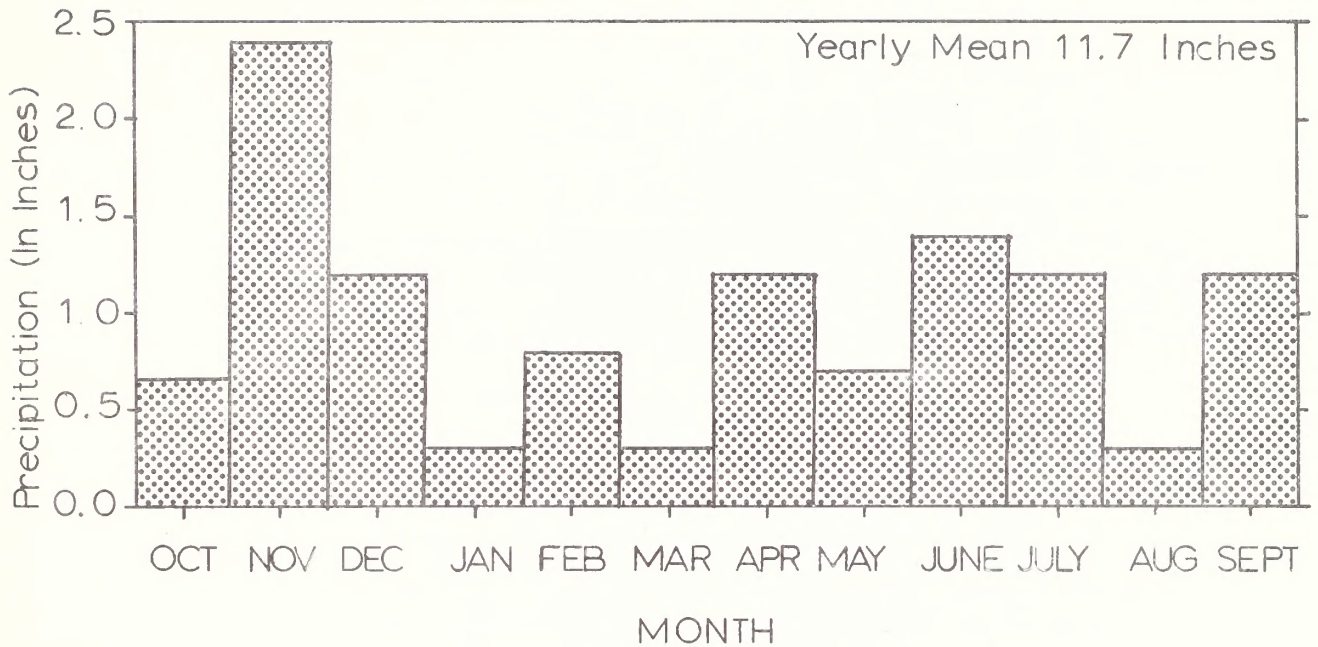


Figure 2. Mean Monthly Precipitation For The Coils Creek Watershed

During the early 1900's some of the local livestock operators combined their efforts and ran sheep to protect themselves and the range from the large transient sheep companies that moved through the area. Later, when these sheep companies were no longer a threat, they returned to cattle operations under individual control. From this, the Bernard Damele operation at the 3-Bar Ranch began its use of the watershed with approximately 500 to 1100 cattle. This use continued until 1956 when the Eureka Livestock Company purchased the 3-Bar Ranch. They run approximately 2000 sheep and 400 cattle in the basin. A rest-rotation grazing system is planned for the area with special attention to the many remnant mountain meadows and season of use.

Wildlife in the area consist primarily of sagegrouse and mule deer.

Recreation use is low. The few annual visitors are primarily interested in hunting.

Land managers constantly require factual information on which to base their programs. There is a special need for detailed data about the vegetation and soils on rangelands. Material included in this report describes the climax and seral units of vegetation and associated soils in the Coils Creek Watershed, one of 12 range watershed study areas in Nevada administered by the U. S. Department of the Interior, Bureau of Land Management. The vegetation-soil analysis herein reported is a portion of a cooperative research effort between the Bureau of Land Management and the Renewable Resources Center of the University of Nevada.

This study was designed as a multiple-purpose ecological inventory of vegetation and soil resources. The study provides fundamental information which can be interpreted and re-interpreted as use patterns change and as an understanding increases without the need for a complete re-survey.

The value of the data outlined in this report lies in the development of relationships between vegetation and soil and the resultant indicator significance of vegetation. For example, a classification of the basic ecological units is necessary for a thorough understanding of the landscape and for interpretation of site potential. However, site potential for a given vegetation-soil unit requires further analysis and the accumulation of data about the value of a management practice if it were applied to the unit in question. Much of this data is not yet available. Management recommendations are curtailed due to the lack of data relating to vegetation-soil units described herein. When such data become available, however, the land manager will be able to easily identify sites within the confines of his unit of responsibility upon which a given practice or management program has been found desirable. An enhanced ability to precisely define range landscapes constitutes the real value of this analysis.

We have attempted to define the vegetation-soil units on the basis of a habitat-type classification. A habitat-type, as defined by Daubenmire (1952) is "the collective area which is capable of supporting the same homogeneous climax plant association." Collective area means a unique ecological entity which can be delineated on a map or aerial photograph. The habitat-type concept indexes site potential since it is an expression of the ultimate unit of the sum environment with regard to vegetation, soil classification unit, topographic placement and, by inference, micro- and mesoclimatic factors.

As an example, we have interpreted the *Artemisia arbuscula/Stipa thurberiana* community to be a habitat-type based on its homogeneity, recurrence, productivity, relict areas and apparent equilibrium with its environment. When a community is not climax, careful evaluation of plant, soil, physiographic and climatological data is necessary in order to speculate as to the probable habitat-type with its specific potential. The *Artemisia arbuscula/Foa secunda* community is an example of seral vegetation. This community occurred on similar soil with similar physio-

graphic placement and climate as *Artemisia arbuscula/Stipa thurberiana* stands found elsewhere. On these bases, the *A. arbuscula/Poa secunda* community was interpreted to be an *A. arbuscula/S. thurberiana* habitat-type. Similar evaluations have been made for most of the communities recognized in the watershed.

The first section of this report is a key to the 17 plant communities. This key refers the reader to the second section, a detailed description of each community. The third section is devoted to a discussion of management suitabilities and ecology of the watershed. This is followed by the appendices which contain precipitation data, soil families and sub-groups associated with the watershed plant communities and vegetation and soil association table. Finally a watershed map illustrates mapping units which consist of plant communities with their respective percentage indicated, roads, precipitation gages, townships, ranges and sections.

Methodology

The vegetation of the Coils Creek Watershed was delineated into plant communities during a reconnaissance. As a general rule, all communities were recognized and delineated on the basis of vegetative characteristics alone. Then as soil and physiographic data were accumulated, this initial delineation was re-evaluated on several occasions until the 17 plant communities described in this report were finally identified and interpreted. These communities were given names corresponding to the major dominant and major sub-dominant species.

Basal Area and Cover Data

After the plant communities were delineated, an intensive study was initiated by an adaptation of methods described by Poulton and Tisdale (1961) and further modified by Tueller (1962).

A 100-foot-square macroplot was used. Five plots were considered ample to adequately describe a community (Eckert, 1957), but on minor or inaccessible communities, only one or two plots were used.

Permanent macroplots were established by running a 100-foot baseline up and down the slope. Plots placed on the level were oriented north and south.

Within each macroplot, four 4- x 50-foot belt transects were randomly located perpendicular to the baseline. Randomization was restricted to prevent transect overlap and to provide for two transects each in the upper and lower half of the macro-plot. This two-way randomization provides for adequate sampling of the full length of the macroplot (Eckert, 1957).

Each belt transect was divided into ten 4- x 5-foot plots thus enabling forty 4- x 5-foot plots to be established in each macroplot. Two kinds of data were obtained from each plot: (1) basal area of the more abundant grasses and forbs, and (2) crown cover estimates of shrubs. A 1-square-foot frame was used as an estimation guide for both basal area and crown cover data.

Basal area was selected because it is relatively free from yearly weather variations and grazing influences (Tueller, 1962). Dead centers which exceeded 25 percent of the area of bunchgrass were excluded from the estimate. Basal area estimates by species were based on the following cover classes (Poulton, 1962):

<u>Class</u>	<u>Class Range Percent</u>	<u>Midpoint Percent</u>
1	0 - 1	0.5
2	1+ - 5	2.5
3	5+ - 10	7.5
4	10+ - 25	17.5
5	25+ - 50	37.5
6	50+ - 75	62.5
7	75+ - 95	85.0
8	95+ - 100	97.5

The midpoint of each class range was used to calculate cover percentage.

Shrub crown cover estimates were obtained by standing directly over the shrub and projecting the foliage cover onto the ground. Estimates were made for each species to the nearest 1 percent of the 4- x 5-foot plot. Openings in the canopy larger than one-quarter of a square foot were not included.

Cover data of species in the meadows were obtained by using the point frame method as described by Levy and Madden (1933).

Tree Density and Crown Cover Data

Crown cover data of trees were obtained from a 66- x 132-foot plot. Trees found within the plots were counted by species and 10 typical tree crowns were measured. From this information the density (trees/acre) and average tree cover was computed for each species by plot.

Frequency Data

Frequency, according to Cain and Castro (1959), is percent presence in plots of a stated size. For example, if a sample of a stand consists of 200 plots, and if one or more plants of a given species occurs in 50 of these plots, the species has a frequency percentage of 25.

Frequency sampling procedures developed by Hyder et al. (1963) were used to supplement cover estimates on each macroplot. Although frequency data are difficult to interpret, the speed and objectivity inherent in the method makes them useful when comparing areas where high statistical precision is needed (Tueller, 1962). Ten frequency transects, each with 20 presence or absence determination quadrats, were located perpendicular to the baseline. Each transect consisted of twenty 20- x 20-inch, 12- x 12-inch, 10- x 10-inch or 3- x 3-inch quadrats placed contiguously and moving away from the baseline. Only those plants rooted inside the frequency quadrats were recorded. A two-stage randomization was applied to these transects: (1) restricting five transects to each half of the macroplot, and (2) preventing transect overlap.

Ground Cover Characteristics. Non-living ground cover was determined by an adaptation of the point frame method as described by Godall (1952). The same 200 frequency plots were used to sample cover but instead of recording presence of vegetation, the bottom tip end of the frequency frame was used as a point. Hits of bare ground, litter, pavement (1/4 to 1-inch diameter), rock (1-inch plus diameter), were recorded.

Constancy. Cain and Castro (1959) define constancy as "the percentage of occurrence of a species on samples of the same size in various stands of a community type." Species constancy percentages were calculated for each macroplot. In order to develop a complete species list for constancy, each 100- x 100-square-foot macroplot was examined carefully after obtaining cover and frequency data. Additional species encountered were added to the list.

Topographic and Physiographic Features. Topographic features of each macroplot were characterized as follows: position on the slope whether top, upper one-third, center one-third, lower one-third, or bottom; slope in percent obtained from an abney level; and aspect from an 8-point compass.

Physiographic placement of each macroplot was characterized as follows: land form - drainage bottom, escarpment, fan, floodplain, plateau, flooded depression, ridge top, slope, or river terrace; macrorelief - flat undulating, rolling, butte, hilly, or mountainous; microrelief - uniform-flat, convex, concave, interrupted mount, pits, ridge and swale.

Soils Study. A soil profile description was made at each macroplot using the procedures outlined in the Soil Survey Manual (1951) and the Seventh Approximation (1960) plus revisions (1967). Horizons, soil color, texture, pH, lime content, structure and consistence were noted for each profile.

Lack of time and money prevented complete laboratory soil analyses. The following parameters were selected because they have been suggested to be indicative of vegetation and soil relationships (Eckert, 1957). Samples from the A1 and B2 horizons were analyzed for conductivity (millimhos per centimeter), pH (from a saturated paste), and organic matter (percent). Cation exchange capacity (milliequivalents per 100 grams) (USDA Handbook No.60, 1954) were determined only on those samples from the A1 horizon.

Family level identifications were made as found in the Seventh Approximation (1960) and revisions (1967). When more than one profile description per family occurred, the modal description was used noting that family.

Each soil was classified as to: hydrologic group (Nevada Dept. of Conservation and Natural Resources and the USDA, 1965); stoniness (USDA, 1951); and estimated water holding capacity based on clay mineralogy and texture (Schokley, 1955). Available water holding capacity was estimated for the rooting depth or to the depth of the soil profile studied if not otherwise stated. Rooting depths were limited by duripans and lithic or paralithic contacts.

Soil boundaries were not physically located and a soil map was not made. Thus detailed comparisons of soils across the boundary were not possible or within the scope of this study. Only the soils at the macroplots were described. The kinds of soils noted at the macroplots are commonly associated with the different kinds of vegetation in this watershed.

Erosion. Using the procedures developed by the Forest Service (USDA, 1964), current soil erosion of each vegetation-soil unit was classified.

Climatic Data. Precipitation data were taken for a 4-year period from non-recording rain gages placed throughout the watershed. The data were then related to each applicable community in inches of annual precipitation.

Temperatures were estimated from existing records at Eureka, located about 32 airline miles to the southeast and with a climate similar to that of the watershed.

KEY TO THE PLANT COMMUNITIES
in the
COILS CREEK WATERSHED

A. Communities with a Pigmy Conifer overstory.

B. Communities with a *Juniperus osteosperma* or a *Pinus monophylla* overstory

C. Community with a *Juniperus osteosperma* overstory and an *Artemisia tridentata* understory.....*Juniperus osteosperma/Artemisia tridentata/Poa secunda* Community. (p.33).

CC. Communities with a *Pinus monophylla* overstory

D. *Artemisia tridentata* understory.....*Pinus monophylla/Artemisia tridentata/Poa secunda* Community..... (p.36).

DD. *Cercocarpus ledifolius* and *Symphoricarpos longiflorus* understory*Pinus monophylla/Cercocarpus ledifolius/Symphoricarpos longiflorus/Balsamorhiza sagittata* Community (p.38).

BB. Communities with *Pinus monophylla* and *Juniperus osteosperma* overstory

C. *Pinus monophylla* and *Juniperus osteosperma* forming a closed community*Pinus monophylla/Juniperus osteosperma* Community..... (p.40).

CC. *Pinus monophylla* and *Juniperus osteosperma* not forming a closed community

D. *Artemisia arbuscula* understory*Pinus monophylla/Juniperus osteosperma/Artemisia arbuscula/Poa secunda* Community..... (p.42).

DD. *Artemisia tridentata* understory*Pinus monophylla/Juniperus osteosperma/Artemisia tridentata/Bromus tectorum* Community..... (p.44).

AA. Communities without a Pigmy Conifer overstory.

B. Communities with a shrub overstory

C. *Artemisia* overstory

D. *Artemisia arbuscula* overstory

- E. *Festuca idahoensis* abundant in the understory
 *Artemisia arbuscula*/*Festuca idahoensis*
 Community.....(p.12).
- EE. *Poa secunda* abundant in the understory....
 Artemisia arbuscula/*Poa secunda*
 Community.....(p.14).
- DD. *Artemisia tridentata* overstory
- E. Additional shrubs as sub-dominants
- F. *Chrysothamnus viscidiflorus* a subdominant
- G. *Sitanion hystrix* abundant in the understory
 *Artemisia tridentata*/*Chrysothamnus*
 viscidiflorus/*Sitanion hystrix* Community..(p.21).
- GG. *Poa secunda* and *Wyethia mollis* abundant
 in the understory....*Artemisia tridentata*/
 Chrysothamnus viscidiflorus/*Poa secunda*/
 Wyethia mollis Community..... (p.19).
- FF. *Chrysothamnus nauseosus* or *Symphoricarpos*
 longiflorus and *Amelanchier pallida* as
 sub-dominants
- G. *Chrysothamnus nauseosus* as a sub-dominant
 *Artemisia tridentata*/*Chrysothamnus*
 nauseosus/*Poa secunda* Community.....(p.16).
- GG. *Symphoricarpos longiflorus* and
 Amelanchier pallida as sub-dominants...
 *Artemisia tridentata*/*Amelanchier*
 pallida/*Symphoricarpos longiflorus*
 Community.....(p.29).
- EE. Not as above
- F. *Poa secunda* abundant in the understory
- G. *Balsamorhiza sagittata* abundant in the
 understory*Artemisia tridentata*/*Poa*
 secunda/*Balsamorhiza sagittata* Community..(p.23).
- GG. *Iva axillaris* abundant in the understory.
 ...*Artemisia tridentata*/*Poa secunda*/*Iva*
 axillaris Community.....(p.25).

GGG. *Phlox diffusa* abundant in the under-
story.....*Artemisia tridentata*/*Poa*
secunda/*Phlox diffusa* Community..... (p.27).

CC. *Symphoricarpos longiflorus* overstory.....
.....*Symphoricarpos longiflorus*/*Artemisia tridentata*/
Bromus tectorum/*Wyethia mollis* Community..... (p.46).

BB. Communities without a shrub overstory

C. *Carex* sp. and *Taraxacum officinale* abundant...*Carex*
sp./*Taraxacum officinale* Community.....(p.31).

Low Sagebrush (*Artemisia arbuscula*) Communities

1. *Artemisia arbuscula*/*Festuca idahoensis* Community

This community occurs as small inclusions on the less accessible ridges in the western part of the watershed.

The community occurs on north facing slopes of 32 percent, elevation is around 7700 feet, and the mean annual precipitation is 10.8 inches (Appendix A).

Low sagebrush (*Artemisia arbuscula*) is the dominant species with 11.8 percent cover and 82.0 percent frequency. Big sagebrush (*Artemisia tridentata*), yellowbrush (*Chrysothamnus viscidiflorus*), longleaf snowberry (*Symphoricarpos longiflorus*), and gray horsebrush (*Tetradymia canescens*) occur in small amounts (0.5 to 1.5 percent frequency).

Idaho fescue (*Festuca idahoensis*) is the most abundant grass (4.1 percent cover and 71.6 percent frequency). Respectively, Sandberg bluegrass (*Poa secunda*), squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), cheatgrass (*Bromus tectorum*), and Thurber needlegrass (*Stipa thurberiana*) occurs with 52.5, 21.0, 19.5, 7.0 and 0.5 percent frequency, respectively.

The most abundant forb is Kings sandwort (*Arenaria kingii*) with 33.0 percent frequency. A number of additional forbs occur with 0.5 to 16.5 percent frequency (Table 1). This community is an *Artemisia arbuscula*/*Festuca idahoensis* habitat-type.

Rock accounts for 47.0 percent of the non-living ground cover, pavement for 23.5 percent, litter for 17.0 percent, and bare ground for 12.5 percent (Table 2).

The soil at the macroplot where this community was sampled is a member of a loamy-skeletal, mixed, frigid family of Lithic Haploxerolls (Appendix B-16).

Table 1. Species Cover and Frequency for the *Artemisia arbuscula*/*Festuca idahoensis* Community

Species	Cover %	20 x 20* Frequency %
<i>Artemisia arbuscula</i>	11.8	82.0
<i>Artemisia tridentata</i>		1.5
<i>Chrysothamnus viscidiflorus</i>		1.0
<i>Symphoricarpos longiflorus</i>		0.5
<i>Tetradymia canescens</i>		0.5
<i>Festuca idahoensis</i>	4.1	71.6
<i>Poa secunda</i>		52.5
<i>Sitanion hystrix</i>		21.0
<i>Agropyron spicatum</i>		19.5
<i>Bromus tectorum</i>		7.0
<i>Stipa thurberiana</i>		0.5
<i>Arenaria kingii</i>		33.0
<i>Eriogonum heermanii</i>		16.5
<i>Lygodesmia spinosa</i>		14.5
<i>Lepidium perfoliatum</i>		10.0
<i>Erigeron pumilus</i>		8.5
<i>Lupinus caudatus</i>		7.0
<i>Castilleja linariaefolia</i>		5.0
<i>Arenaria hookei</i>		3.5
<i>Astragalus purshii</i>		3.5
<i>Phlox longifolia</i>		3.0
<i>Crepis acuminata</i>		1.0
<i>Astragalus</i> sp.		0.5

* Frame size in inches.

Table 2. Non-living Ground Cover for the *Artemisia arbuscula*/*Festuca idahoensis* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	12.5
Litter	17.0
Pavement	23.5
Rock	47.0

2. *Artemisia arbuscula*/*Poa secunda* Community

This is one of the largest communities and is found in most parts of the watershed.

The community occurs on north, northeast, east, southeast and west facing slopes and terraces with 3 to 23 percent slope, elevation ranges from 7100 to 8100 feet, and the mean annual precipitation is 11.7 inches (Appendix A).

Low sagebrush (*Artemisia arbuscula*) is the dominant species (14.7 percent cover and 71.3 percent frequency). Yellowbrush (*Chrysothamnus viscidiflorus*) when present, occurs with 9.1 percent frequency with additional shrubs occurring with 14 to 29 percent constancy and 0.1 to 0.6 percent frequency.

Sandberg bluegrass (*Poa secunda*) is the most abundant grass with 6.5 percent cover and 83.1 percent frequency. Squirreltail (*Sitanion hystrix*), Thurber needlegrass (*Stipa thurberiana*), Idaho fescue (*Festuca idahoensis*), cheatgrass (*Bromus tectorum*), bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*) and Letterman needlegrass (*Stipa lettermani*) occur in the community with 10 to 100 percent constancy and 0.1 to 16.6 percent frequency.

A large number of forbs occur erratically (14 to 86 percent constancy) with Kings sandwort (*Arenaria kingii*) the most frequent (6.4 percent) (Table 3). This community is probably a seral representative of an *Artemisia arbuscula*/*Stipa thurberiana* habitat-type.

Litter accounts for 42.4 percent of the non-living ground cover, bare ground for 22.0 percent, pavement for 20.8 percent, and rock for 14.2 percent (Table 4).

The soils at the macroplot where this community was sampled are members of a fine, mixed, frigid, shallow family of Mollic Haplargids (Appendix B-6); clayey-skeletal, mixed, frigid family of Lithic Mollic Haplargids (Appendix B-5); and very fine, montmorillonitic, frigid family of Mollic Paleic Durargids (Appendix B-8).

Table 3. Species Cover, Frequency and Constancy for
the *Artemisia arbuscula*/*Poa secunda* Community

Species	20 x 20*		
	Cover %	Frequency %	Constancy %
<i>Artemisia arbuscula</i>	14.7	11.3	100
<i>Chrysothamnus viscidiflorus</i>		9.1	86
<i>Tetradymia canescens</i>		0.9	29
<i>Artemisia tridentata</i>		0.6	29
<i>Symphoricarpos longiflorus</i>		0.4	29
<i>Opuntia polyacantha</i>		0.1	14
<i>Poa secunda</i> (10 x 10)*	6.5	83.1	100
<i>Sitanion hystrix</i>		16.6	100
<i>Stipa thurberiana</i>		5.4	43
<i>Festuca idahoensis</i>		3.5	29
<i>Bromus tectorum</i>		2.3	71
<i>Agropyron spicatum</i>		0.6	57
<i>Oryzopsis hymenoides</i>		0.6	14
<i>Stipa lettermani</i>		0.1	14
<i>Arenaria kingii</i>		6.4	57
<i>Lupinus caudatus</i>		4.0	71
<i>Aster scopulorum</i>		3.5	43
<i>Phlox longifolia</i>		3.2	86
<i>Erigeron</i> sp.		3.1	43
<i>Crepis acuminata</i>		2.5	57
<i>Lygodesmia spinosa</i>		2.2	14
<i>Eriogonum andium</i>		2.1	57
<i>Lomatium</i> sp.		2.1	42
<i>Balsamorhiza hookeri</i>		1.8	29
<i>Astragalus purshii</i>		1.4	57
<i>Balsamorhiza sagittata</i>		1.0	43
<i>Cordylanthus ramosus</i>		0.9	29
<i>Phlox diffusa</i>		0.7	29
<i>Iva axillaris</i>		0.7	14
<i>Arabis holboellii</i>		0.6	14
<i>Erigeron pumilus</i>		0.6	14
<i>Astragalus atratus</i>		0.5	29
<i>Eriogonum heermanii</i>		0.3	43
<i>Senecio integerrimus</i>		0.2	29
<i>Aster</i> sp.		0.2	14
<i>Castilleja linariaefolia</i>		0.2	14
<i>Chaenactis douglasii</i>		0.1	14
<i>Cirsium vulgare</i>		0.1	14
<i>Zigadenus paniculatus</i>		0.1	14

* Frame size in inches

Table 4. Non-living Ground Cover for the
Artemisia arbuscula/Poa secunda
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	22.9
Litter	42.2
Pavement	20.7
Rock	14.2

Big Sagebrush (*Artemisia tridentata*) Communities

1. *Artemisia tridentata/Chrysothamnus nauseosus/* *Poa secunda* Community

This community occurs in the main drainage to the north and south of the large meadow owned by the 3-Bar Ranch.

The community occurs on south, southeast and west facing drainage bottoms and fans with 1 percent slope, elevation ranges from 6800 to 7100 feet, and the mean annual precipitation is 11.2 inches (Appendix A).

This community has resulted from overgrazing, gully erosion, and draining a meadow which allowed species like big sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Chrysothamnus nauseosus*), Sandberg bluegrass (*Poa secunda*), poverty sumpweed (*Iva axillaris*) and others to invade and/or increase to their present status in the community.

Big sagebrush is the dominant species with 15.7 percent cover and 54.2 percent frequency. Rubber rabbitbrush occurs with 2.0 percent cover and 20.3 percent frequency, and a few additional shrubs are found in small erratic amounts.

Sandberg bluegrass is the most abundant grass (4.0 percent cover and 68.5 percent frequency) and bluestem wheatgrass (*Agropyron smithii*), Great Basin wildrye (*Elymus cinereus*), squirreltail (*Sitanion hystrix*), Nevada bluegrass (*Poa nevadensis*) and cheatgrass (*Bromus tectorum*) occur with 33 to 100 percent constancy and 1.0 to 5.7 percent frequency.

Carex sp. and threadhead sedge (*Carex filifolia*) occur with 3.7 and 0.2 percent frequency, and 33 and 33 percent constancy, respectively. The most abundant forbs are *Erigeron* sp., poverty sumpweed and *Phlox diffusa*. Respectively, they occur with constancy ratings of 67, 100 and 33 percent, and frequency values of 15.8, 14.3 and 10.5 percent. A number of additional forbs are found in small amounts (Table 5). This community is probably a seral representative of a *Poa nevadensis/Carex* sp. habitat-type.

Litter accounts for 66.5 percent of the non-living ground cover, bare ground for 32.5 percent, pavement for 1.0 percent and rock for 0.0 percent (Table 6).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Fluventic Haplustolls (Appendix B-12).

Table 5. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Chrysothamnus nauseosus*/
Poa secunda Community

Species	20 x 20*	
	Cover %	Frequency % Constancy %
<i>Artemisia tridentata</i>	15.7	54.2 100
<i>Chrysothamnus nauseosus</i>	2.9	20.3 100
<i>Chrysothamnus viscidiflorus</i>		11.0 33
<i>Leptodactylon pungens</i>		0.8 33
<i>Poa secunda</i>	4.0	68.5 100
<i>Agropyron smithii</i>		5.7 67
<i>Elymus cinereus</i>		4.3 100
<i>Sitanion hystrix</i>		3.3 100
<i>Poa nevadensis</i>		1.7 33
<i>Bromus tectorum</i>		1.0 33
<i>Carex</i> sp.		3.7 33
<i>Carex filifolia</i>		0.2 33
<i>Erigeron</i> sp.		15.8 67
<i>Iva axillaris</i>		14.3 100
<i>Astragalus purshii</i>		10.5 33
<i>Phlox diffusa</i>		4.3 100
<i>Lupinus caudatus</i>		2.3 67
<i>Achillea lanulosa</i>		1.8 33
<i>Lygodesmia spinosa</i>		0.8 33
<i>Astragalus atratus</i>		0.3 33
<i>Senecio integerrimus</i>		0.3 33
<i>Taraxacum officinale</i>		0.3 33
<i>Lupinus</i> sp.		0.2 33

Frame size in inches

Table 6. Non-living Ground Cover for the *Artemisia*
tridentata/*Chrysothamnus nauseosus*/*Poa*
secunda Community

Material	Cover %
Bare ground	32.5
Litter	66.5
Pavement	1.0
Rock	0.0

2. *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/
Poa secunda/*Wyethia mollis* Community

This community has developed on hills and mountains in the south-east and west part of the watershed.

The community occurs on east facing slopes of 11 to 32 percent, elevation ranges from 7100 to 8150 feet, and the mean annual precipitation is 11.2 inches (Appendix A).

Big sagebrush (*Artemisia tridentata*) and yellowbrush (*Chrysothamnus viscidiflorus*) occur with 15.6 and 2.0 percent cover, and 27.0 and 28.5 percent frequency. A few additional shrubs are found with 0.2 to 1.0 percent frequency and 33 to 67 percent constancy.

Sandberg bluegrass (*Poa secunda*), squirreltail (*Sitanion hystrix*), cheatgrass (*Bromus tectorum*) and Letterman needlegrass (*Stipa lettermani*) are the most abundant grasses. Respectively, they account for 27.7, 26.0, 22.7 and 19.5 percent frequency and 100, 100, 100 and 67 percent constancy. Subalpine needlegrass (*Stipa columbiana*), oniongrass (*Melica bulbosa*), Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Agropyron spicatum*), slender wheatgrass (*Agropyron trachycaulon*), mountain brome (*Bromus marginatus*) and Great Basin wildrye (*Elymus cinereus*) occur with 0.7 to 13.2 percent frequency and 33 to 67 percent constancy. *Carex* sp. is found with frequency of 2.7 percent and constancy of 33 percent.

Woolly wyethia (*Wyethia mollis*), tailcup lupine (*Lupinus caudatus*) and arrowleaf balsamroot (*Balsamorhiza sagittata*) are the most frequent forbs (37.2, 30.8 and 16.8 percent, respectively) with 100 percent constancy. A large number of additional forbs occur with frequency of 0.2 to 11.7 percent and constancy percents of 33 to 100 (Table 7). This community is probably a seral representative of *Artemisia tridentata*/*Stipa lettermani* habitat-type.

Litter accounts for 63.8 percent of the non-living ground cover, bare ground for 16.4 percent, pavement for 14.8 percent, and rock for 5.0 percent (Table 8).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Entic Haploxerolls (Appendix B-14); or clayey-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-18).

Table 7. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Chrysothamnus viscidiflorus*/
Poa secunda/*Wyethia mollis* Community

Species	20 x 20*		
	Cover %	Frequency %	Constancy %
<i>Artemisia tridentata</i>	15.6	27.8	100
<i>Chrysothamnus viscidiflorus</i>	2.0	28.5	100
<i>Symphoricarpos longiflorus</i>		1.0	67
<i>Opuntia polyacantha</i>		0.5	33
<i>Amelanchier pallida</i>		0.2	33
<i>Poa secunda</i>	1.4	27.7	100
<i>Sitanion hystrix</i>		26.0	100
<i>Bromus tectorum</i>		22.7	100
<i>Stipa lettermani</i>		19.5	67
<i>Stipa columbiana</i>		13.2	67
<i>Melica bulbosa</i>		8.2	67
<i>Festuca idahoensis</i>		5.7	33
<i>Agropyron spicatum</i>		2.8	67
<i>Agropyron trachycaulum</i>		3.5	33
<i>Bromus marginatus</i>		2.0	67
<i>Elymus cinereus</i>		0.7	67
<i>Carex</i> sp.		2.7	33
<i>Wyethia mollis</i>	11.4	37.3	100
<i>Lupinus caudatus</i>		30.8	100
<i>Balsamorhiza sagittata</i>	2.0	16.8	100
<i>Collinsia grandiflora</i>		11.7	67
<i>Erigeron pumilus</i>		7.5	67
<i>Comandra pallida</i>		3.2	33
<i>Arabis holboellii</i>		2.7	100
<i>Astragalus</i> sp.		2.7	33
<i>Lappula redowskii</i>		2.5	67
<i>Senecio integerrimus</i>		1.5	100
<i>Navarretia</i> sp.		1.0	33
<i>Crepis acuminata</i>		0.8	67
<i>Machaeranthera canescens</i>		0.8	67
<i>Penstemon kingii</i>		0.8	67
<i>Phlox longifolia</i>		0.8	67
<i>Astragalus purshii</i>		0.3	33
<i>Lomatium</i> sp.		0.3	33
<i>Penstemon speciosus</i>		0.3	33
<i>Eriastrum diffusum</i>		0.2	33
<i>Eriogonum heermanii</i>		0.2	33

* Frame size in inches

Table 8. Non-living Ground Cover for the *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Poa secunda*/*Wyethia mollis* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	16.4
Litter	63.8
Pavement	14.8
Rock	5.0

3. *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/
Sitanion hystrix Community

This community occurs mostly on concave mountain slopes in the western part of the watershed.

The community occurs on north and northeast facing slopes of 21 to 30 percent, elevation ranges from 7600 to 8300 feet, and the mean annual precipitation is 10.9 inches (Appendix A).

Big sagebrush (*Artemisia tridentata*) and yellowbrush (*Chrysothamnus viscidiflorus*) occur with 28.2 and 3.0 percent cover, and 61.0 and 27.5 percent frequency. Longflower snowberry (*Symphoricarpos longiflorus*), when present, occurs with 1.5 percent frequency.

Lupinus sp., tailcup lupine (*Lupinus caudatus*) and arrowleaf balsam-root (*Balsamorhiza sagittata*) are the most frequent forbs with 39.8, 15.5 and 13.5 percent, respectively. A number of additional forbs are found with 0.2 to 5.2 percent frequency (Table 9). This community is probably a seral representative of an *Artemisia tridentata*/*Stipa lettermani* habitat-type.

Litter accounts for 82.4 percent of the non-living ground cover, bare ground for 9.2 percent, pavement for 6.2 percent, and rock for 2.2 percent (Table 10).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Entic Haploxerolls (Appendix B-14).

Table 9. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Chrysothamnus viscidiflorus*/
Sitanion hystrix Community

Species	20 x 20*		
	Cover %	Frequency %	Constancy %
<i>Artemisia tridentata</i>	28.2	61.0	100
<i>Chrysothamnus viscidiflorus</i>	3.0	27.5	100
<i>Symphoricarpos longiflorus</i>		1.5	50
<i>Sitanion hystrix</i>		39.5	100
<i>Bromus tectorum</i>		19.2	100
<i>Agropyron trachycaulum</i>		12.5	100
<i>Melica bulbosa</i>		5.5	100
<i>Stipa columbiana</i>		4.0	100
<i>Poa secunda</i>		3.8	100
<i>Stipa lettermani</i>		3.5	100
<i>Festuca idahoensis</i>		2.0	100
<i>Bromus marginatus</i>		1.2	100
<i>Elymus cinereus</i>		1.0	50
<i>Lupinus</i> sp.	2.4	39.8	100
<i>Lupinus caudatus</i>		15.5	100
<i>Balsamorhiza sagittata</i>		13.5	100
<i>Arabis holboellii</i>		5.2	100
<i>Collinsia grandiflora</i>		3.0	50
<i>Phlox longifolia</i>		3.0	50
<i>Agoseris glauca</i>		1.8	50
<i>Comandra pallida</i>		1.5	50
<i>Senecio integerrimus</i>		1.2	50
<i>Crepis acuminata</i>		0.8	50
<i>Astragalus</i> sp.		0.2	50
<i>Chenopodium leptophyllum</i>		0.2	50

*Frame size in inches

Table 10. Non-living Ground Cover for the *Artemisia*
tridentata/*Chrysothamnus viscidiflorus*/
Sitanion hystrix Community

<u>Material</u>	<u>Cover %</u>
Bare ground	9.2
Litter	82.4
Pavement	6.2
Rock	2.2

4. *Artemisia tridentata*/*Poa secunda*/*Balsamorhiza sagittata* Community

This community is located on mountains and hills in the western, eastern and northern part of the watershed.

The community occurs on north, northwest, west and south facing slopes of 1 to 45 percent, elevation ranges from 7200 to 7900 feet, and the mean annual precipitation is 13.0 inches (Appendix A).

Big sagebrush (*Artemisia tridentata*) is the dominant shrub with 10.7 percent cover and 46.9 percent frequency. Yellowbrush (*Chrysothamnus viscidiflorus*) and longflower snowberry (*Symphoricarpos longiflorus*) occur with 23.7 and 5.5 percent frequency, and 100 and 60 percent constancy, respectively. Additional shrubs are found with 0.1 to 0.5 percent frequency, and 20 to 60 percent constancy.

Sandberg bluegrass (*Poa secunda*), cheatgrass (*Bromus tectorum*) and bluebunch wheatgrass (*Agropyron spicatum*) are the most abundant grasses. Respectively, they account for 2.6, 2.3 and 1.4 percent cover, and 47.6, 41.6 and 17.1 percent frequency. Squirreltail (*Sitanion hystrix*), Great Basin wildrye (*Elymus cinereus*), Thurber needlegrass (*Stipa thurberiana*) and Indian ricegrass (*Oryzopsis hymenoides*) frequency ranges from 0.2 to 14.4 percent and from 20 to 100 percent constancy.

Arrowleaf balsamroot (*Balsamorhiza sagittata*) is the most abundant forb with 0.9 percent cover and 15.2 percent frequency. A number of additional forbs are found with frequency values that range from 0.1 to 14.1 percent and constancy of 20 to 80 percent (Table 11). This community is probably a seral representative of an *Artemisia tridentata*/*Agropyron spicatum* habitat-type.

Litter accounts for 47.6 percent of the non-living ground cover, bare ground for 28.7 percent, pavement for 16.0 percent and rock for 7.7 percent (Table 12).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Lithic Mollic Haplargids (Appendix B-7); loamy-skeletal, mixed, frigid family of Entic Haploxerolls (Appendix B-14) and clayey-skeletal, mixed, frigid family of Lithic Argixerolls (Appendix B-20).

Table 11. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Poa secunda*/*Balsamorhiza*
sagittata Community

Species	Cover %	20 x 20*	
		Frequency %	Constancy %
<i>Artemisia tridentata</i>	10.7	46.9	100
<i>Chrysothamnus viscidiflorus</i>	1.8	23.7	100
<i>Symphoricarpos longiflorus</i>		5.5	60
<i>Artemisia arbuscula</i>		1.5	60
<i>Tetradymia canescens</i>		1.3	20
<i>Amelanchier pallida</i>		0.4	40
<i>Eriogonum microthecum</i>		0.2	20
<i>Chrysothamnus nauseosus</i>		0.1	40
<i>Poa secunda</i>	2.6	47.6	100
<i>Bromus tectorum</i>	2.3	41.6	100
<i>Agropyron spicatum</i>	1.4	17.1	100
<i>Sitanion hystrix</i>		14.4	100
<i>Elymus cinereus</i>		5.3	60
<i>Stipa thurberiana</i>		2.1	60
<i>Oryzopsis hymenoides</i>		0.2	20
<i>Balsamorhiza sagittata</i>	0.9	15.2	100
<i>Phlox diffusa</i>		14.1	40
<i>Lupinus caudatus</i>		9.4	100
<i>Eriogonum heermanii</i>		4.8	20
<i>Heliotropium curassavicum</i>		3.4	80
<i>Crepis acuminata</i>		1.6	80
<i>Astragalus</i> sp.		1.4	60
<i>Phlox longifolia</i>		1.3	60
<i>Astragalus atratus</i>		0.6	40
<i>Machaeranthera canescens</i>		0.4	40
<i>Arabis holboellii</i>		0.4	40
<i>Astragalus purshii</i>		0.4	20
<i>Lappula redowskii</i>		0.4	20
<i>Senecio integerrimus</i>		0.3	20
<i>Arabis</i> sp.		0.2	20
<i>Erigeron pumilus</i>		0.2	20
<i>Eriogonum andium</i>		0.1	20
<i>Cryptantha jamesii</i>		0.1	20
<i>Wyethia mollis</i>		0.1	20

*Frame size in inches

Table 12. Non-living Ground Cover for the *Artemisia tridentata*/*Poa secunda* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	28.7
Litter	47.6
Pavement	16.0
Rock	7.7

5. *Artemisia tridentata*/*Poa secunda*/*Iva axillaris* Community

This community occurs mostly in the main drainage to the north of the *Artemisia tridentata*/*Chrysothamnus nauseosus* community.

The community is found on west and southeast facing fans and drainage bottoms with 1 to 5 percent slope, elevation ranges from 7100 to 7300 feet, and the mean annual precipitation is 11.2 inches (Appendix A).

Big sagebrush (*Artemisia tridentata*) is the dominant species with 16.2 percent cover and 61.5 percent frequency. Yellowbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and prickly phlox (*Leptodactylon pungens*) occur with frequency and constancy percents that range from 0.8 to 16.5, and 66 to 100, respectively.

Sandberg bluegrass (*Poa secunda*) is the most abundant grass with 10.1 percent cover and 69.5 percent frequency. Squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), Great Basin wildrye (*Elymus cinereus*) and bluestem wheatgrass (*Agropyron smithii*) have 23.5, 4.8, 2.5 and 2.2 percent frequency and 100, 33, 100, 33 percent constancy, respectively. *Carex* sp., threadleaf sedge (*Carex filifolia*) and baltic rush (*Juncus balticus*) account for 9.5, 3.3 and 2.0 percent frequency, and 33, 67 and 67 percent constancy.

Poverty sumpweed (*Iva axillaris*), *Phlox diffusa* and pursh locoweed (*Astragalus purshii*) are the most frequent forbs (29.3, 28.2 and 21.8 percent, respectively). Additional forbs occur with frequency values that range from 0.2 to 9.2 percent and constancy ratings that range from 33 to 67 percent (Table 13). This community is probably a seral representative of a *Poa nevadensis*/*Carex* sp. habitat-type which has been channeled and drained.

Litter accounts for 56.0 percent of the non-living ground cover, bare-ground for 42.8 percent, pavement for 1.2 percent and rock for 0.0 percent (Table 14).

The soils at the macroplots where this community was sampled are members of a fine-loamy, mixed, frigid family of Fluventic Haplaquolls (Appendix B-9).

Table 13. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Poa secunda*/*Iva axillaris*
Community

Species	20 x 20*		
	Cover	% Frequency	% Constancy
<i>Artemisia tridentata</i>	16.3	61.5	100
<i>Chrysothamnus viscidiflorus</i>		16.5	100
<i>Chrysothamnus nauseosus</i>		3.7	66
<i>Leptodactylon pungens</i>		0.8	100
<i>Poa secunda</i>	10.1	69.5	100
<i>Sitanion hystrix</i>		23.5	100
<i>Agropyron spicatum</i>		4.8	33
<i>Elymus cinereus</i>		2.5	100
<i>Agropyron smithii</i>		2.2	33
<i>Carex</i> sp.		9.5	33
<i>Carex filifolia</i>		3.3	67
<i>Juncus balticus</i>		2.0	67
<i>Iva axillaris</i>		29.3	100
<i>Phlox diffusa</i>		28.2	100
<i>Astragalus purshii</i>		21.8	67
<i>Eriogonum purshii</i>		9.2	67
<i>Lupinus caudatus</i>		6.6	67
<i>Astragalus</i> sp.		1.3	33
<i>Achillea lanulosa</i>		0.8	33
<i>Caulanthus crassicaulis</i>		0.5	33
<i>Taraxacum officinale</i>		0.4	33
<i>Eriogonum umbellatum</i>		0.3	33
<i>Arabis</i> sp.		0.2	33

*Frame size in inches

Table 14. Non-living Ground Cover for the *Artemisia*
tridentata/*Poa secunda*/*Iva axillaris* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	42.8
Litter	56.0
Pavement	1.2
Rock	0.0

6. *Artemisia tridentata*/*Poa secunda*/*Phlox diffusa* Community.

This community has developed on fans and terraces in the western and eastern part of the watershed.

The community occurs on east, southeast and southwest facing terraces and fans with 1 to 4 percent slope, elevation ranges from 6850 to 7500 feet and the mean annual precipitation is 11.6 inches.

Big sagebrush (*Artemisia tridentata*) is the most abundant shrub (14.0 percent cover and 57.5 percent frequency). Yellowbrush (*Chrysothamnus viscidiflorus*), prickly phlox (*Leptodactylon pungens*) and plains pricklypear (*Opuntia polyacantha*) occur with frequency of 0.2 to 13.6 percent and constancy of 33 to 100 percent.

Sandberg bluegrass (*Poa secunda*) is found with 6.2 percent cover and 84.2 percent frequency. Squirreltail (*Sitanion hystrix*), Thurber needlegrass (*Stipa thurberiana*), Great Basin wildrye (*Elymus cinereus*), Indian ricegrass (*Oryzopsis hymenoides*), and bluebunch wheatgrass (*Agropyron spicatum*) occur with 15.2, 12.6, 0.4, 0.3 and 0.2 percent frequency, respectively, and 33 to 100 percent constancy. *Carex* sp. is found in small drainages with 0.9 percent frequency and 17 percent constancy.

Phlox diffusa is the most frequent forb (44.2 percent). Other forbs have frequency from 0.2 to 5.0 percent and constancy from 17 to 100 percent (Table 15). This community is probably a seral representative of an *Artemisia tridentata*/*Stipa thurberiana* habitat-type.

Litter accounts for 43.4 percent of the non-living ground cover, bare ground for 40.7 percent, pavement for 13.0 percent and rock for 2.9 percent (Table 16).

The soils at the macroplots where this community was sampled are members of a fine-loamy, mixed, frigid family of Mollic Camborthids (Appendix B-1); fine, mixed, frigid family of Mollic Haplargids (Appendix B-2); and very-fine, montmorillonitic frigid family of Mollic Paleic Durargids (Appendix B-8).

Table 15. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Poa secunda*/*Phlox diffusa*
 Community

Species	20 x 20*		
	Cover %	Frequency %	Constancy %
<i>Artemisia tridentata</i>	14.0	57.5	100
<i>Chrysothamnus viscidiflorus</i>		13.6	100
<i>Leptodactylon pungens</i>		1.2	83
<i>Opuntia polyacantha</i>		0.2	33
<i>Poa secunda</i>	6.2	84.2	100
<i>Sitanion hystrix</i>		15.2	100
<i>Stipa thurberiana</i>		12.6	67
<i>Elymus cinereus</i>		0.4	33
<i>Oryzopsis hymenoides</i>		0.3	33
<i>Agropyron spicatum</i>		0.2	33
<i>Carex</i> sp.		0.9	17
<i>Phlox diffusa</i>		44.2	100
<i>Astragalus purshii</i>		5.1	100
<i>Lupinus</i> sp.		3.9	17
<i>Lupinus caudatus</i>		3.1	17
<i>Astragalus atratus</i>		2.9	17
<i>Erigeron</i> sp.		2.9	17
<i>Erigeron pumilus</i>		0.7	33
<i>Phlox longifolia</i>		0.7	17
<i>Eriogonum andium</i>		0.4	50
<i>Cryptantha jamesii</i>		0.2	17
<i>Spraeralcea coccinea</i>		0.2	17

*Frame size in inches

Table 16. Non-living Ground Cover for the *Artemisia tridentata*/
Poa secunda/*Phlox diffusa* Community

Material	Cover %
Bare ground	40.7
Litter	43.4
Pavement	13.0
Rock	2.9

7. *Artemisia tridentata*/*Amelanchier pallida*/*Symphoricarpos longiflorus* Community

This community occurs on mountains in the western part of the watershed.

The community is found on north, east and south facing slopes of 12 to 25 percent, elevation ranges from 7400 to 8000 feet and the mean annual precipitation is 10.6 inches (Appendix A).

Big sagebrush (*Artemisia tridentata*), longflower snowberry (*Symphoricarpos longiflorus*) and serviceberry (*Amelanchier pallida*) are the most abundant shrubs with big sagebrush the dominant species. Respectively, they account for 10.2, 4.5 and 4.5 percent cover, and 32.7, 24.0 and 16.8 percent frequency. Additional shrubs account for 0.1 and 13.8 percent frequency and 33 to 100 percent constancy.

Sandberg bluegrass (*Poa secunda*), cheatgrass (*Bromus tectorum*), squirreltail (*Sitanion hystrix*) and bluebunch wheatgrass (*Agropyron spicatum*) have constancy ratings of 100 percent and 33.7, 24.0, 19.7 and 12.8 percent frequency, respectively. Letterman needlegrass (*Stipa lettermani*), Idaho fescue (*Festuca idahoensis*), subalpine needlegrass (*Stipa columbiana*) and oniongrass (*Melica bulbosa*) occur with frequency values from 0.5 to 9.3 percent and constancy values from 33 to 67 percent.

Arrowleaf balsamroot (*Balsamorhiza sagittata*) and tapertip hawkbeard (*Crepis acuminata*) are most frequent forbs (37.3 and 11.8 percent, respectively) with additional forbs occurring with 0.2 to 10.3 percent frequency and 33 to 100 percent constancy (Table 17). This community is probably a seral representative of a *Symphoricarpos longiflorus*/*Amelanchier pallida*/*Artemisia tridentata*/*Stipa lettermani* habitat-type.

Litter accounts for 46.0 percent of the non-living ground cover, bare ground for 29.5 percent, pavement for 12.5 percent, and rock for 12.0 percent (Table 18).

The soils at the macroplots where this community was sampled are members of a fine, mixed, frigid family of Lithic Argixerolls (Appendix B-19) and clayey-skeletal, mixed, frigid family of Lithic Argixerolls (Appendix B-20).

Table 17. Species Cover, Frequency and Constancy for the
Artemisia tridentata/*Amelanchier pallida*/
Symphoricarpos longiflorus Community

Species	20 x 20*		
	Cover %	Frequency %	Constancy %
<i>Artemisia tridentata</i>	10.2	32.7	100
<i>Symphoricarpos longiflorus</i>	4.5	24.0	100
<i>Amelanchier pallida</i>	4.5	16.8	100
<i>Chrysothamnus viscidiflorus</i>		13.2	100
<i>Chrysothamnus nauseosus</i>		8.2	33
<i>Artemisia arbuscula</i>		1.7	66
<i>Tetradymia canescens</i>		0.3	66
<i>Opuntia polyacantha</i>		0.1	33
<i>Poa secunda</i>		33.7	100
<i>Bromus tectorum</i>		24.0	100
<i>Sitanion hystrix</i>		19.7	100
<i>Agropyron spicatum</i>		12.8	100
<i>Stipa lettermani</i>		9.3	67
<i>Festuca idahoensis</i>		4.5	33
<i>Stipa columbiana</i>		2.2	33
<i>Melica bulbosa</i>		0.5	33
<i>Balsamorhiza sagittata</i>		32.3	100
<i>Crepis acuminata</i>		11.8	100
<i>Senecio integerrimus</i>		10.3	67
<i>Lupinus caudatus</i>		8.3	100
<i>Machaeranthera canescens</i>		5.3	67
<i>Eriogonum sp.</i>		5.2	67
<i>Lygodesmia spinosa</i>		5.2	67
<i>Collinsia grandiflora</i>		5.0	67
<i>Cryptantha jamesii</i>		3.2	67
<i>Phlox longifolia</i>		2.8	67
<i>Wyethia mollis</i>		2.8	33
<i>Arabis holboellii</i>		2.7	66
<i>Ipomopsis aggregata</i>		2.2	33
<i>Comandra pallida</i>		1.2	66
<i>Eriogonum umbellatum</i>		0.5	33
<i>Astragalus sp.</i>		0.3	33
<i>Eriogonum andium</i>		0.3	33
<i>Lappula redowskii</i>		0.3	33
<i>Navarretia sp.</i>		0.3	33
<i>Allium acuminatum</i>		0.2	33
<i>Arenaria kingii</i>		0.2	33
<i>Astragalus purshii</i>		0.2	33
<i>Castilleja linariaefolia</i>		0.2	33
<i>Lomatium sp.</i>		0.2	33

*Frame size in inches

Table 18. Non-living Ground Cover for the *Artemisia tridentata*/*Amelanchier pallida*/*Symphoricarpos longiflorus* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	29.5
Litter	46.0
Pavement	12.5
Rock	12.0

Sedge (*Carex* sp.) Community

Carex sp./*Taraxacum officinale* Community

This community is located as an inclusion in most parts of the watershed. The largest stand is found in the main drainage and is hayed by the 3-Bar Ranch.

The community occurs on west and east facing drainage bottoms with 2 percent slope, the elevation ranges from 7000 to 7900 feet, and the mean annual precipitation is 12.1 inches (Appendix A).

Slender wheatgrass (*Agropyron trachycaulum*) is the most abundant grass with 2.2 percent cover and 1.5 percent frequency. Meadow barley (*Hordeum brachyantherum*), cheatgrass (*Bromus tectorum*) and Nevada bluegrass (*Poa nevadensis*) account for 2.5, 1.5 and 1.0 percent frequency, respectively.

Carex sp. is the most abundant species in the community with 25.0 percent cover and 81.5 percent frequency. Baltic rush (*Juncus balticus*) occurs with 0.1 percent frequency.

Common dandelion (*Taraxacum officinale*), Rocky mountain iris (*Iris missouriensis*), western yarrow (*Achillea lanulosa*) and *Aster adscendens* are the most abundant forbs. Respectively, they have cover percents of 11.0, 10.4, 3.0 and 3.0 and frequency percents of 38.0, 16.5, 12.5 and 8.5. *Potentilla flabelliformis* and bull thistle (*Cirsium vulgare*) occur with 2.0 and 1.0 percent frequency (Table 19). This community is probably a seral representative of a *Poa nevadensis*/*Carex* sp. habitat-type.

Vegetation accounts for 54.6 percent of the ground cover characteristics, bare ground for 32.0 percent, litter for 8.0 percent, pavement for 5.4 percent and rock for 0.0 percent (Table 20).

The soils at the macroplots where this community was sampled are members of a fine-silty, mixed, frigid family of Cumulic Haplaquolls (Appendix B-10).

Table 19. Species Cover and Frequency for the *Carex* sp./
Taraxacum officinale Community

Species	Cover %	12 x 12* Frequency %
<i>Agropyron trachycaulum</i>	2.2	1.5
<i>Hordeum brachyantherum</i>		2.5
<i>Bromus tectorum</i>		1.5
<i>Poa nevadensis</i>		1.0
<i>Carex</i> sp. (3 x 3)*	25.0	81.5
<i>Juncus balticus</i>		0.1
<i>Taraxacum officinale</i> (3 x 3)*	11.0	38.0
<i>Iris missouriensis</i>	10.4	16.5
<i>Achillea lanulosa</i>	3.0	12.5
<i>Aster adscendens</i>	3.0	8.5
<i>Potentilla flabelliformis</i>		2.0
<i>Cirsium vulgare</i>		1.0

*Frame size in inches

Table 20. Ground Cover Characteristics for the
Carex sp./*Taraxacum officinale* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	32.0
Litter	8.0
Pavement	5.4
Rock	0.0
Vegetation	54.6

Juniper (*Juniperus osteosperma*) Community

Juniperus osteosperma/*Artemisia tridentata*/
Poa secunda Community

This community occurs in the lower elevations in the eastern part of the watershed.

The community is found on northwest and southeast facing slopes and terraces with 6 to 12 percent slope, elevation ranges from 6600 to 7300 feet and the mean annual precipitation is 11.5 inches (Appendix A).

Juniper (*Juniperus osteosperma*) occurs in the community with a density of 33.5 trees/acre, and 10.5 percent cover. Big sagebrush (*Artemisia tridentata*) is the most abundant shrub (14.4 percent cover and 61.3 percent frequency). Additional shrubs are found with frequency values that range from 0.2 to 3.3 percent and constancy ratings that range from 33 to 100 percent.

Sandberg bluegrass (*Poa secunda*), cheatgrass (*Bromus tectorum*) and bluebunch wheatgrass (*Agropyron spicatum*) occur with cover of 2.9, 0.4 and 0.4 percent, frequency of 75.5, 20.9 and 19.7 percent, respectively. Squirreltail (*Sitanion hystrix*), Great Basin wildrye (*Elymus cinereus*), Thurber needlegrass (*Stipa thurberiana*), Indian ricegrass (*Oryzopsis hymenoides*) and bluestem wheatgrass (*Agropyron smithii*) occur with frequency of 2.2 to 17.7 percent, and constancy percents of 33 to 100.

Phlox diffusa is the most frequent forb with 30.2 percent. A number of additional forbs occur with 0.1 to 7.3 percent frequency and 33 to 100 percent constancy (Table 21). This community is probably a seral representative of a *Juniperus osteosperma*/*Artemisia tridentata*/*Agropyron spicatum* habitat-type.

Litter accounts for 45.0 percent of the non-living ground cover, pavement for 27.0 percent, bare ground for 26.3 percent and rock for 1.7 percent (Table 22).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Haplic Durixerolls (Appendix B-17).

Table 21. Species Density, Cover, Frequency and Constancy
for the *Juniperus osteosperma*/*Artemisia tridentata*/
Poa secunda Community

Species	Density**	Cover	20 x 20*	
			% Frequency	% Constancy
<i>Juniperus osteosperma</i>	33.5	10.5		100
<i>Artemisia tridentata</i>		14.4	61.3	100
<i>Leptodactylon pungens</i>			3.3	100
<i>Artemisia arbuscula</i>			2.7	33
<i>Tetradymia canescens</i>			1.2	33
<i>Chrysothamnus viscidiflorus</i>			1.0	67
<i>Grayia spinosa</i>			0.3	33
<i>Opuntia polyacantha</i>			0.2	33
<i>Poa secunda</i> (10 x 10)*		2.9	75.5	100
<i>Bromus tectorum</i>		0.4	20.0	67
<i>Agropyron spicatum</i>		0.4	19.7	100
<i>Sitanion hystrix</i>			17.7	100
<i>Elymus cinereus</i>			7.5	100
<i>Stipa thurberiana</i>			4.5	33
<i>Oryzopsis hymenoides</i>			3.3	33
<i>Agropyron smithii</i>			2.2	33
<i>Phlox diffusa</i>			30.2	100
<i>Astragalus purshii</i>			7.3	100
<i>Erigeron pumilus</i>			3.3	67
<i>Crepis acuminata</i>			2.8	33
<i>Lupinus caudatus</i>			2.1	33
<i>Eriogonum andium</i>			1.6	33
<i>Cryptantha jamesii</i>			1.2	67
<i>Astragalus</i> sp.			0.7	67
<i>Lomatium</i> sp.			0.7	67
<i>Balsamorhiza sagittata</i>			0.3	33
<i>Chaenactis douglassii</i>			0.3	33
<i>Eriogonum umbellatum</i>			0.3	33
<i>Sphaeralcea coccinea</i>			0.3	33
<i>Astragalus lentiginosus</i>			0.1	33

*Frame size in inches

**Trees/acre

Table 22. Non-living Ground Cover for the *Juniperus*
osteosperma/*Artemisia tridentata*/*Poa secunda*
 Community

<u>Material</u>	<u>Cover %</u>
Bare ground	26.3
Litter	45.0
Pavement	27.0
Rock	1.7

Pinyon (*Pinus monophylla*) Communities

1. *Pinus monophylla*/*Artemisia tridentata*/*Poa secunda* Community

This community has developed on hills and mountains in the eastern part of the watershed.

The community is found on north, northwest and west facing slopes of 22 to 43 percent, elevation ranges from 6700 to 7000 feet, and the mean annual precipitation is 12.4 inches (Appendix A).

Pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*) occur in the community with a density of 173.0 and 30.0 trees/acre, 24.0 and 4.5 percent cover, and 100 and 67 percent constancy, respectively.

Big sagebrush (*Artemisia tridentata*) is the most abundant shrub with 5.4 percent cover and 48.7 percent frequency. Longflower snowberry (*Symphoricarpos longiflorus*) and yellowbrush (*Chrysothamnus viscidiflorus*) occur with 29.0 and 16.0 percent frequency, respectively. Additional shrubs are found with frequency percents that range from 1.2 to 4.5 and constancy percents from 33 to 100.

Sandberg bluegrass (*Poa secunda*) occurs with 1.5 percent cover and 47.5 percent frequency. Squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), bluebunch wheatgrass (*Agropyron spicatum*), Great Basin wildrye (*Elymus cinereus*) and cheatgrass (*Bromus tectorum*) are found with frequency of 0.5 to 8.3 percent, and constancy of 33 to 100 percent.

Phlox diffusa, arrowleaf balsamroot (*Balsamorhiza sagittata*) and *Lupinus* sp. are present with 35.0, 16.7 and 10.3 percent frequency, respectively. A number of additional forbs occur with 0.2 to 3.8 percent frequency and 33 to 100 percent constancy (Table 23). This community is probably a seral representative of a *Pinus monophylla*/*Artemisia tridentata*/*Agropyron spicatum* habitat-type.

Pavement accounts for 47.5 percent of the non-living ground cover, litter for 34.3 percent, bare ground for 15.7 percent and rock for 2.5 percent.

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Mollic Camborthids (Appendix B-27); clayey-skeletal, mixed, frigid family of Mollic Haplargids (Appendix B-3); clayey-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-18); and clayey-skeletal, mixed, frigid family of Lithic Argixerolls (Appendix B-20).

Table 23. Species Density, Cover, Frequency and Constancy
for the *Pinus monophylla*/*Artemisia tridentata*/
Poa secunda Community

Species	Density**	20 x 20*	
		Cover %	Frequency % Constancy %
<i>Pinus monophylla</i>	173.0	24.0	100
<i>Juniperus osteosperma</i>	30.0	4.5	67
<i>Artemisia tridentata</i>		5.4	48.7 100
<i>Symphoricarpos longiflorus</i>			29.0 100
<i>Chrysothamnus viscidiflorus</i>			16.0 100
<i>Tetradymia canescens</i>			4.5 67
<i>Leptodactylon pungens</i>			3.8 67
<i>Cowania stansburiana</i>			3.2 100
<i>Amelanchier pallida</i>			2.5 100
<i>Chrysothamnus nauseosus</i>			1.7 67
<i>Artemisia arbuscula</i>			1.2 33
<i>Poa secunda</i> (10 x 10)*		1.5	47.5 100
<i>Sitanion hystrix</i>			8.3 67
<i>Oryzopsis hymenoides</i>			6.3 33
<i>Agropyron spicatum</i>			5.2 100
<i>Elymus cineris</i>			1.3 33
<i>Bromus tectorum</i>			0.5 33
<i>Phlox diffusa</i>			35.0 100
<i>Balsamorhiza sagittata</i>			16.7 100
<i>Lupinus</i> sp.			10.3 100
<i>Crepis acuminata</i>			3.8 100
<i>Arabis</i> sp.			2.0 33
<i>Astragalus purshii</i>			1.0 33
<i>Cryptantha jamesii</i>			0.8 33
<i>Chaenactis douglassii</i>			0.5 33
<i>Eriogonum heermanii</i>			0.5 67
<i>Wyethia mollis</i>			0.5 67
<i>Lupinus caudatus</i>			0.3 33
<i>Lygodesmia spinosa</i>			0.3 67
<i>Astragalus</i> sp.			0.2 33
<i>Lomatium</i> sp.			0.2 33
<i>Machaeranthera canescens</i>			0.2 33

* Frame size in inches

** Trees/acre

Table 24. Non-living Ground Cover for the *Pinus monophylla*/
Artemisia tridentata/*Poa secunda* Community

<u>Material</u>	<u>Cover %</u>
Bare ground	15.7
Litter	34.3
Pavement	47.5
Rock	2.5

2. *Pinus monophylla*/*Cercocarpus ledifolius*/*Symphoricarpos longiflorus*/*Balsamorhiza sagittata* Community

This community occurs on mountains in the east-central part of the watershed.

The community occurs on northwest facing slopes of 35 percent, elevation is around 7100 feet, and the mean annual precipitation is 13.2 inches (Appendix A).

Pinyon (*Pinus monophylla*) and curleaf mountain mahogany (*Cercocarpus ledifolius*) occur with density of 70.0 and 50.0 trees/acre and 4.3 and 1.4 percent cover, respectively.

Longflower snowberry (*Symphoricarpos longiflorus*) and yellowbrush (*Chrysothamnus viscidiflorus*) are the most frequent shrubs (52.0 and 37.0 percent, respectively). Big sagebrush (*Artemisia tridentata*) and gray horsebrush (*Tetradymia canescens*) occur with 13.5 and 1.5 percent frequency, respectively.

Sandberg bluegrass (*Poa secunda*) and Idaho fescue (*Festuca idahoensis*) are found with 44.5 and 37.0 percent frequency, respectively. Great Basin wildrye (*Elymus cinereus*), squirreltail (*Sitanion hystrix*) and subalpine needlegrass (*Stipa columbiana*) occur with 1.0 to 4.5 percent frequency.

Arrowleaf balsamroot (*Balsamorhiza sagittata*) and *Phlox diffusa* are the most frequent forbs (61.5 and 31.0 percent, respectively), with additional forbs occurring in small amounts (Table 25). This community is probably a seral representative of a *Pinus monophylla*/*Cercocarpus ledifolius*/*Symphoricarpos longiflorus*/*Festuca idahoensis* habitat-type.

Litter accounts for 52.5 percent of the non-living ground cover, bare ground for 34.5 percent, rock for 7.5 percent and pavement for 5.5 percent (Table 26).

The soil at the macroplot where this community was sampled is a member of a coarse-loamy, mixed, frigid family of Calcic Pachic Haploxerolls (Appendix B-13).

Table 25. Species Density, Cover and Frequency for the
Pinus monophylla/*Cercocarpus ledifolius*/
Symphoricarpos longiflorus/*Balsamorhiza sagittata*
 Community

Species	Density**	Cover %	20 x 20* Frequency %
<i>Pinus monophylla</i>	70.0	4.3	
<i>Cercocarpus ledifolius</i>	50.0	1.4	
<i>Symphoricarpos longiflorus</i>			52.0
<i>Chrysothamnus viscidiflorus</i>			37.0
<i>Artemisia tridentata</i>			13.5
<i>Tetradymia canescens</i>			1.5
<i>Poa secunda</i>			44.5
<i>Festuca idahoensis</i>			37.0
<i>Elymus cinereus</i>			4.5
<i>Sitanion hystrix</i>			4.5
<i>Stipa columbiana</i>			1.0
<i>Balsamorhiza sagittata</i>			61.5
<i>Phlox diffusa</i>			31.0
<i>Crepis acuminata</i>			3.5
<i>Arabis holboellii</i>			2.0
<i>Eriogonum heermanii</i>			1.5
<i>Lupinus caudatus</i>			1.0
<i>Erigeron pumilus</i>			0.5

* Frame size in inches

** Trees/acre

Table 26. Non-living Ground Cover for the *Pinus monophylla*/
Cercocarpus ledifolius/*Symphoricarpos longiflorus*/
Balsamorhiza sagittata Community

Material	Cover %
Bare ground	34.5
Litter	52.5
Pavement	5.5
Rock	7.5

Pinyon-Juniper (*Pinus monophylla*/*Juniperus osteosperma*)
Communities

1. *Pinus monophylla*/*Juniperus osteosperma* Community

This community occurs on hills and mountains, mostly at low elevations, in the eastern part of the watershed.

The community occurs on south and west facing slopes of 14 to 30 percent, elevation ranges from 6800 to 7500 feet, and the mean annual precipitation is 13.2 inches (Appendix A).

Pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*) occur with a density of 124.0 and 54.0 trees/acre and 26.3 and 16.8 percent cover, respectively.

Big sagebrush is the most abundant shrub with 1.4 percent cover, 6.0 percent frequency and 80 percent constancy. Low sagebrush (*Artemisia arbuscula*), longflower snowberry (*Symphoricarpos longiflorus*), rubber rabbitbrush (*Chrysothamnus nauseosus*), yellowbrush (*Chrysothamnus viscidiflorus*), Mormon tea (*Ephedra nevadensis*) and plains pricklypear (*Opuntia polyacantha*) are found with frequency of 0.3 to 4.0 percent and constancy of 20 to 60 percent.

Sandberg bluegrass (*Poa secunda*) and cheatgrass (*Bromus tectorum*) are the most frequent grasses (30.2 and 24.0 percent, respectively) and have constancy ratings of 100 and 60 percent, respectively. Bluebunch wheatgrass (*Agropyron spicatum*), squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*) and Great Basin wildrye (*Elymus cinereus*) occur with 0.3 to 5.6 percent frequency and 20 to 80 percent constancy.

Phlox diffusa occurs with 6.5 percent frequency and 80 percent constancy. Additional forbs are found with trace to 2.0 percent frequency and 20 to 40 percent constancy (Table 27). This community is a *Pinus monophylla*/*Juniperus osteosperma* habitat-type.

Litter accounts for 42.7 percent of the non-living ground cover, pavement for 22.7 percent, bare ground for 18.2 percent and rock for 16.8 percent (Table 28).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid family of Lithic Mollic Haplargids (Appendix B-7); loamy-skeletal, mixed, frigid family of Haplic Durixerolls (Appendix B-17); clayey-skeletal, mixed, frigid family of Lithic Argixerolls (Appendix B-20); and loamy-skeletal, mixed, frigid family of Lithic Argixerolls (Appendix B-21).

Table 27. Species Density, Cover, Frequency and Constancy
for the *Pinus monophylla*/*Juniperus osteosperma*
Community

Species	Density**	Cover%	20 x 20*	
			Frequency %	Constancy %
<i>Pinus monophylla</i>	124.0	26.3		100
<i>Juniperus osteosperma</i>	54.0	16.8		100
<i>Artemisia tridentata</i>		1.4	6.0	80
<i>Artemisia arbuscula</i>			4.0	60
<i>Symphoricarpos longiflorus</i>			0.9	40
<i>Chrysothamnus nauseosus</i>			0.4	40
<i>Chrysothamnus viscidiflorus</i>			0.4	40
<i>Ephedra nevadensis</i>			0.3	20
<i>Opuntia polyacantha</i>			0.3	20
<i>Poa secunda</i>			30.2	100
<i>Bromus tectorum</i>			24.0	60
<i>Agropyron spicatum</i>			5.6	80
<i>Sitanion hystrix</i>			3.4	80
<i>Oryzopsis hymenoides</i>			1.7	40
<i>Elymus cinereus</i>			0.3	20
<i>Phlox diffusa</i>			6.5	80
<i>Lomatium sp.</i>			2.0	20
<i>Balsamorhiza sagittata</i>			1.9	20
<i>Astragalus sp.</i>			1.1	20
<i>Cryptantha jamesii</i>			0.8	40
<i>Astragalus purshii</i>			0.5	40
<i>Chaenactis douglassii</i>			0.3	20
<i>Arabis sp.</i>			0.2	40
<i>Astragalus atratus</i>			0.1	20
<i>Eriogonum andium</i>			0.1	20
<i>Lupinus caudatus</i>			0.1	20
<i>Petrophytum caespitosum</i>			0.1	20
<i>Eriogonum umbellatum</i>			0.1	20

* Frame size in inches

** Trees/acre

Table 28. Non-living Ground Cover for the *Pinus monophylla*/*Juniperus osteosperma* Community

Material	Cover %
Bare ground	18.2
Litter	42.7
Pavement	22.7
Rock	16.4

2. *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula*/*Poa secunda* Community

This community has developed on mountains and hills in the eastern part of the watershed.

The community occurs on north and northeast facing slopes of 6 to 27 percent, elevation ranges from 7000 to 7300 feet, and the mean annual precipitation is 13.2 inches (Appendix A).

Pinyon (*Pinus monophylla*), juniper (*Juniperus osteosperma*) and curlleaf mountain mahogany (*Cercocarpus ledifolius*) occur with a density of 45.0, 30.0 and 20.0 trees/acre, and 4.6, 3.9 and 3.6 percent cover, respectively.

Low sagebrush (*Artemisia arbuscula*) is the most abundant shrub (8.4 percent cover and 43.0 percent frequency) with big sagebrush (*Artemisia tridentata*) and yellowbrush (*Chrysothamnus viscidiflorus*) less frequent (4.0 and 0.5 percent, respectively).

Sandberg bluegrass (*Poa secunda*) occurs with 1.4 percent cover and 33.0 percent frequency. Cheatgrass (*Bromus tectorum*), squirreltail (*Sitanion hystrix*), rock melic (*Melica stricta*) and Letterman needlegrass (*Stipa lettermani*) are found with frequency values that range from 0.5 to 19.5 percent.

Tailcup lupine (*Lupinus caudatus*) is the most frequent forb (2.5 percent) with other forbs less abundant (1.0 and 2.0 percent frequency) (Table 29). This community is probably a seral representative of a *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula*/*Stipa lettermani* habitat-type.

Pavement accounts for 38.0 percent of the non-living ground cover, litter for 31.5 percent, bare ground for 20.0 percent and rock for 10.5 percent (Table 30).

The soils at the macroplots where this community was described are members of a loamy-skeletal, mixed, frigid, shallow family of Lithic Haploxerolls (Appendix B-16); and loamy-skeletal, mixed, frigid family of Lithic Argixerolls (Appendix B-21).

Table 29. Species Density, Cover and Frequency for the
Pinus monophylla/*Juniperus osteosperma*/*Artemisia*
arbuscula/*Poa secunda* Community

Species	Density**	20 x 20*	
		Cover %	Frequency %
<i>Pinus monophylla</i>	45.0	4.6	
<i>Juniperus osteosperma</i>	30.0	3.9	
<i>Cercocarpus ledifolius</i>	20.0	3.6	
<i>Artemisia arbuscula</i>		8.4	43.0
<i>Artemisia tridentata</i>			4.0
<i>Chrysothamnus viscidiflorus</i>			0.5
<i>Poa secunda</i>		1.4	33.0
<i>Bromus tectorum</i>			19.5
<i>Sitanion hystrix</i>			11.0
<i>Melica stricta</i>			5.0
<i>Stipa lettermani</i>			0.5
<i>Lupinus caudatus</i>			2.5
<i>Phlox diffusa</i>			2.0
<i>Arabis holboellii</i>			1.0
<i>Balsamorhiza sagittata</i>			1.0
<i>Castilleja chromosa</i>			1.0
<i>Erigeron pumilus</i>			1.0
<i>Eriogonum umbellatum</i>			1.0

* Frame size in inches

** Trees/acre

Table 30. Non-living Ground Cover for the *Pinus monophylla*/
Juniperus osteosperma/*Artemisia arbuscula*/*Poa secunda*
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	20.0
Litter	31.5
Pavement	38.0
Rock	10.5

3. *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*/*Bromus tectorum* Community

This is one of the larger communities in the eastern part of the watershed, and is found on hills and mountains.

The community occurs on south and west facing slopes of 14 to 38 percent, elevation ranges from 7400 to 7500 feet and the mean annual precipitation is 11.9 inches (Appendix A).

Pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*) occur in all stands with an average density of 81.5 and 30.0 trees/acre, and an average cover of 22.4 and 4.1 percent, respectively.

Big sagebrush (*Artemisia tridentata*) and yellowbrush (*Chrysothamnus viscidiflorus*) are the most abundant shrubs with 4.5 and 1.0 percent cover, and 18.5 and 8.2 percent frequency, respectively. Low sagebrush (*Artemisia arbuscula*), rubber rabbitbrush (*Chrysothamnus nauseosus*), longflower snowberry (*Symphoricarpos longiflorus*) and serviceberry (*Amelanchier pallida*) are found with 0.3 to 2.7 percent frequency and 33 to 100 percent constancy.

Cheatgrass (*Bromus tectorum*) and Sandberg bluegrass (*Poa secunda*) occur in all stands with 2.5 and trace percent cover, and 64.2 and 41.8 percent frequency, respectively. Squirreltail (*Sitanion hystrix*), bluebunch wheatgrass (*Agropyron spicatum*), Thurber needlegrass (*Stipa thurberiana*), Great Basin wildrye (*Elymus cinereus*), Indian ricegrass (*Oryzopsis hymenoides*) and Idaho fescue (*Festuca idahoensis*) are found with frequency percents of 0.2 to 8.8, and constancy percent of 33 to 100.

Phlox diffusa and tailcup lupine (*Lupinus caudatus*) occur with 15.7 and 4.7 percent frequency, and 67 and 100 percent constancy, respectively. Additional forbs occur with frequency of 0.2 to 2.8 percent and constancy of 33 to 67 percent (Table 31). This community is probably a seral representative of a *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*/*Agropyron spicatum* habitat-type.

Litter accounts for 55.5 percent of the non-living ground cover, pavement for 18.6 percent, bare ground for 16.4 percent and rock for 9.5 percent (Table 32).

The soils at the macroplots where this community was sampled are members of a clayey-skeletal, mixed, frigid family of Lithic Mollic Haplargids (Appendix B-6) and clayey-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-18).

Table 31. Species Density, Cover, Frequency and Constancy
for the *Pinus monophylla*/*Juniperus osteosperma*/
Artemisia tridentata/*Bromus tectorum* Community

Species	20 x 20*			
	Density**	Cover %	Frequency %	Constancy %
<i>Pinus monophylla</i>	81.5	22.4		100
<i>Juniperus osteosperma</i>	30.0	4.1		100
<i>Artemisia tridentata</i>		4.5	18.5	100
<i>Chrysothamnus viscidiflorus</i>		1.0	8.2	100
<i>Artemisia arbuscula</i>			2.7	100
<i>Chrysothamnus nauseosus</i>			1.2	33
<i>Symphoricarpos longiflorus</i>			0.7	33
<i>Amelanchier pallida</i>			0.3	33
<i>Bromus tectorum</i>		2.5	64.2	100
<i>Poa secunda</i>			41.8	100
<i>Sitanion hystrix</i>			8.8	100
<i>Agropyron spicatum</i>			5.7	100
<i>Stipa thurberiana</i>			3.5	67
<i>Elymus cinereus</i>			0.7	100
<i>Oryzopsis hymenoides</i>			0.5	33
<i>Festuca idahoensis</i>			0.2	33
<i>Phlox diffusa</i>			15.7	67
<i>Lupinus caudatus</i>			4.7	100
<i>Balsamorhiza sagittata</i>			2.8	67
<i>Machaeranthera canescens</i>			2.3	33
<i>Chaenactis douglassii</i>			1.0	33
<i>Erigeron</i> sp.			0.8	33
<i>Wyethia mollis</i>			0.8	33
<i>Iva axillaris</i>			0.7	33
<i>Lomatium</i> sp.			0.5	67
<i>Astragalus</i> sp.			0.2	33
<i>Asragalus purshii</i>			0.2	33
<i>Eriogonum</i> sp.			0.2	33
<i>Eriogonum andium</i>			0.2	33
<i>Phlox longifolia</i>			0.2	33
<i>Senecio integerrimus</i>			0.2	33

* Frame size in inches

** Trees/acre

Table 32. Non-living Ground Cover for the *Pinus monophylla*/
Juniperus osteosperma/*Artemisia tridentata*/*Poa secunda*
Community

<u>Material</u>	<u>Cover %</u>
Bare ground	16.4
Litter	55.5
Pavement	18.6
Rock	9.5

Longflower Snowberry (*Symphoricarpos longiflorus*) Community

1. *Symphoricarpos longiflorus*/*Artemisia tridentata*/
Bromus tectorum/*Wyethia mollis* Community

This community is found throughout the watershed as small inclusions.

The community usually occurs on north facing drainage bottoms with 9 percent slope, elevation is around 7350 feet, and the mean annual precipitation is 12.0 inches (Appendix A).

Longflower snowberry (*Symphoricarpos longiflorus*) and big sagebrush (*Artemisia tridentata*) are the most abundant shrubs with 19.9 and 4.7 percent cover and 25.0 and 23.5 percent frequency. Yellowbrush (*Chrysothamnus viscidiflorus*) and low sagebrush (*Artemisia arbuscula*) occur with 11.5 and 7.0 percent frequency, respectively.

Cheatgrass (*Bromus tectorum*), Sandberg bluegrass (*Poa secunda*) and squirreltail (*Sitanion hystrix*) are the most frequent grasses (69.0, 52.2 and 41.5 percent, respectively). Idaho fescue (*Festuca idahoensis*), Letterman needlegrass (*Stipa lettermani*), bluebunch wheatgrass (*Agropyron spicatum*) and Great Basin wildrye (*Elymus cinereus*) occur with frequency percents that range from 4.0 to 11.0.

Woolly wyethia (*Wyethia mollis*) is found with 5.3 percent cover and 21.0 percent frequency. Additional forbs occur with frequency of 0.5 to 19.0 percent (Table 33). This community is probably a seral representative of a *Symphoricarpos longiflorus*/*Artemisia tridentata*/*Stipa lettermani* habitat-type.

Litter accounts for 67.0 percent of the non-living ground cover, pavement for 20.5 percent, bare ground for 10.5 percent and rock for 2.0 percent (Table 34).

The soil at the macroplot where this community was sampled is a member of a loamy-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-22).

Table 33. Species Cover and Frequency for the *Symphoricarpos longiflorus*/*Artemisia tridentata*/*Bromus tectorum*/*Wyethia mollis* Community

Species	Cover %	20 x 20*
		Frequency %
<i>Symphoricarpos longiflorus</i>	19.9	25.0
<i>Artemisia tridentata</i>	4.7	23.5
<i>Chrysothamnus viscidiflorus</i>		11.5
<i>Artemisia arbuscula</i>		7.0
<i>Bromus tectorum</i>		68.0
<i>Poa secunda</i>		52.5
<i>Sitanion hystrix</i>		41.5
<i>Festuca idahoensis</i>		11.0
<i>Stipa lettermani</i>		6.0
<i>Agropyron spicatum</i>		5.0
<i>Elymus cinereus</i>		4.0
<i>Wyethia mollis</i>	5.3	21.0
<i>Erigeron</i> sp.		19.0
<i>Lupinus caudatus</i>		13.5
<i>Balsamorhiza sagittata</i>		4.5
<i>Eriastrum diffusum</i>		2.5
<i>Lappula redowskii</i>		2.5
<i>Eriogonum</i> sp.		2.0
<i>Gayophytum ramosissimum</i>		1.5
<i>Machaeranthera canescens</i>		1.5
<i>Crepis acuminata</i>		1.0
<i>Phlox longifolia</i>		1.0
<i>Senecio integerrimus</i>		0.5
<i>Sphaeralcea</i> sp.		0.5

* Frame size in inches

Table 34. Non-living Ground Cover for the *Symphoricarpos longiflorus*/*Artemisia tridentata*/*Bromus tectorum*/*Wyethia mollis* Community

Material	Cover %
Bare ground	10.5
Litter	67.0
Pavement	20.5
Rock	2.0

DISCUSSION

MANAGEMENT AREAS

Livestock grazing in most communities has been associated with a reduction of the more palatable grasses, forbs and shrubs, and the invasion or increase of undesirable plants. The result has been an apparent decrease in cover and frequency of the more desirable forage species.

Range Rehabilitation and Improvement:

There are several vegetation-soil units in the basin that will lend themselves to mechanical or chemical improvements. The *Artemisia tridentata*/*Chrysothamnus nauseosus*/*Poa secunda* and *Artemisia tridentata*/*Poa secunda*/*Iva axillaris* communities are seral representatives of a *Poa nevadensis*/*Carex* sp. habitat-type, and the *Artemisia tridentata*/*Poa secunda*/*Phlox diffusa* community is a seral representative of an *Artemisia tridentata*/*Stipa thurberiana* habitat-type. The more palatable species in these communities have decreased due to overgrazing and less desirable species such as *Artemisia tridentata*, *Chrysothamnus nauseosus*, *Poa secunda*, *Iva axillaris*, *Phlox diffusa*, *Sitanion hystrix* have increased and now dominate the sites. These communities occur on terraces, fans and drainage bottoms with 1 to 5 percent slope, rock cover is low (0 to 2.9 percent) and annual precipitation is 11.2 to 11.6 inches. The communities could be plowed and seeded to adapted species.

The *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Poa secunda*/*Wyethia mollis*, *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Sitanion hystrix* and *Artemisia tridentata*/*Poa secunda*/*Balsamorhiza sagittata* communities are seral representatives of *Symphoricarpos longiflorus*/*Artemisia tridentata*/*Stipa lettermani*, *Artemisia tridentata*/*Stipa lettermani* and *Artemisia tridentata*/*Agropyron spicatum* habitat-types, respectively. These communities have a fairly high frequency of palatable grasses such as *Agropyron trachycaulum*, *Agropyron spicatum*, *Bromus marginatus*, *Festuca idahoensis*, *Melica bulbosa*, *Stipa columbiana* and *Stipa lettermani*. These communities occur on slopes of 1 to 45 percent, rock cover is 2.0 to 7.7 percent and annual precipitation is 10.9 to 13.0 inches. The communities could be sprayed for control of undesirable shrub and forb species.

Management By Grazing:

The vegetation-soil units in this watershed have a high potential and present an excellent opportunity to evaluate a rest-rotation system of grazing. If such a grazing system is applied to this basin a close evaluation should be made. The condition and trend of the plant communities, sagegrouse, deer and livestock populations; run-off and erosion should also be closely evaluated.

ECOLOGICAL INTERPRETATIONS

The *Artemisia arbuscula/Festuca idahoensis* and *Pinus monophylla/Juniperus osteosperma* communities are in near pristine condition, while all other communities are seral. These communities and their associated soils are given in Appendix C and discussed below.

As small inclusions on the less accessible north facing slopes of 32 percent in the western part of the watershed the *Artemisia arbuscula/Festuca idahoensis* community has developed. This community is a representative of an *Artemisia arbuscula/Festuca idahoensis* habitat-type. It occurs on soils with a 7-inch mollic epipedon over a massive, very gravelly sandy clay loam C1 horizon and lithic contact within 20 inches of the surface, and a 12-inch mollic epipedon over slate.

In most parts of the watershed on north, northeast, east, southeast and west facing slopes and terraces with 3 to 23 percent slope, the *Artemisia arbuscula/Poa secunda* community is found. It is probably a seral representative of an *Artemisia arbuscula/Stipa thurberiana* habitat-type. It occurs on soils with a 4-inch ochric epipedon over a strong fine platy, gravelly clay loam argillic horizon and with paralithic contact within 8 inches of the soil surface; a 4- to 8-inch ochric epipedon over a moderate fine subangular blocky, gravelly light clay argillic horizon with lithic contact within 16 to 18 inches of the soil surface; and a 7- to 9-inch ochric epipedon over a strong medium prismatic, heavy clay argillic horizon and with an indurated duripan within 23-28 inches of the surface.

The *Artemisia tridentata/Chrysothamnus nauseosus/Poa secunda*, *Artemisia tridentata/Poa secunda/Iva axillaris*, and *Carex* sp./*Taraxacum officinale* communities vary in size and are found throughout the watershed mostly on south, southeast, east and west facing drainage bottoms and fans with 1 to 5 percent slope. These communities are probably seral representatives of a *Poa nevadensis/Carex* sp. habitat-type, where many stands have been overgrazed and gullied allowing undesirable species to dominate. They are found on soils with a 14-inch mollic epipedon over a weak medium prismatic, silty clay C1 horizon and with mottles in the lower part of the epipedon (this soil has recently been gullied and drained); a 30-inch mollic epipedon over a massive silty clay 11C2 horizon with mottles in the lower epipedon; an 11-inch mollic epipedon over a massive, gravelly sandy loam 11C1 horizon; and an 11-inch mollic epipedon over a weak medium subangular blocky, silt loam cambic horizon.

The *Symphoricarpos longiflorus/Artemisia tridentata/Bromus tectorum/Wyethia mollis* community is probably a seral representative of a *Symphoricarpos longiflorus/Stipa lettermani* habitat-type where less palatable species have increased due to grazing. This community occurs throughout the watershed as small areas on north and east facing slopes and drainage bottoms with 9 to 32 percent slope. It occurs on soils with

a 10-inch mollic epipedon over a moderate fine subangular blocky, very gravelly clay loam argillic horizon.

The *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Poa secunda*/*Wyethia mollis* and *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Sitanion hystrix* communities have developed mostly on north and north-east facing concave mountain slopes of 11 to 32 percent in the western part of the watershed. They occur on soils with a 17- to 18-inch mollic epipedon over a massive, gravelly sandy clay loam Cl horizon and a 10-inch mollic epipedon over a moderate fine subangular blocky, very gravelly heavy clay loam argillic horizon. These communities are probably a seral representative of an *Artemisia tridentata*/*Stipa lettermani* habitat-type.

The *Artemisia tridentata*/*Poa secunda*/*Balsamorhiza sagittata* community is located on north, northeast, west and south facing slopes of 1 to 45 percent in the western, eastern and northern part of the watershed. It occurs on soils with a 6- to 8-inch ochric epipedon over a moderate medium subangular blocky, gravelly clay loam argillic horizon and with lithic contact within 17 inches of the soil surface; a 17- to 18-inch mollic epipedon over a massive, gravelly sandy clay loam Cl horizon; and a 4- to 10-inch mollic epipedon over strong fine subangular blocky, gravelly clay argillic horizon and lithic contact with 9 to 18 inches of the soil surface. This community is probably a seral representative of an *Artemisia tridentata*/*Agropyron spicatum* habitat-type.

The *Artemisia tridentata*/*Poa secunda*/*Phlox diffusa* community is found on east, southeast and southwest facing terraces and fans with 1 to 4 percent slope in the western and eastern part of the watershed. It occurs on soils with an 8-inch ochric epipedon over a massive, light clay loam cambic horizon; a 10-inch ochric epipedon over a massive, very gravelly sandy clay loam cambic horizon and lime mottles within 19 inches of the surface; and a 7- to 9-inch ochric epipedon over a strong medium prismatic, heavy clay argillic horizon and with an indurated duripan within 23 to 28 inches of the surface. This community is probably a seral representative of an *Artemisia tridentata*/*Stipa thurberiana* habitat-type.

In the western part of the watershed, on north, east and south facing slopes of 12 to 25 percent, the *Artemisia tridentata*/*Amelanchier pallida*/*Symphoricarpos longiflorus* community has developed. It occurs on soils with a 12-inch mollic epipedon over and in conjunction with a strong fine subangular blocky, light clay argillic horizon and lithic contact within 12 inches of the surface; and a 4- to 10-inch mollic epipedon over a strong fine subangular blocky, gravelly clay argillic horizon and lithic contact within 9 to 18 inches of the soil surface. This community is probably a seral representative of a *Symphoricarpos longiflorus*/*Amelanchier pallida*/*Artemisia tridentata*/*Stipa lettermani* habitat-type.

The *Juniperus osteosperma*/*Artemisia tridentata*/*Poa secunda* community has developed in the eastern part of the watershed on north-west and southeast facing slopes and terraces with 6 to 12 percent slope. It occurs on soils with a 6- to 13-inch mollic epipedon over a massive gravelly silty clay loam cambic horizon and with an indurated duripan within 16 to 22 inches of the surface. This community is probably a seral representative of a *Juniperus osteosperma*/*Artemisia tridentata*/*Agropyron spicatum* habitat-type.

The *Pinus monophylla*/*Artemisia tridentata*/*Poa secunda* community occurs in the eastern part of the watershed on north, northwest and west facing slopes of 22 to 43 percent. It is found on soils with a 10-inch ochric epipedon over a massive, very gravelly sandy clay loam cambic horizon and lime mottles within 19 inches of the surface; a 5-inch ochric epipedon over a moderate fine subangular blocky, gravelly light clay argillic horizon and lime mottles within 17 inches of the soil surface; a 10-inch mollic epipedon over a moderate fine subangular blocky, very gravelly heavy clay loam argillic horizon; and a 4- to 10-inch mollic epipedon over a strong fine subangular blocky, gravelly clay argillic horizon and lithic contact within 9 to 18 inches of the soil surface. This community is probably a seral representative of a *Pinus monophylla*/*Artemisia tridentata*/*Agropyron spicatum* habitat-type.

In the east central part of the watershed on northwest facing slopes of 35 percent the *Pinus monophylla*/*Cercocarpus ledifolius*/*Symphoricarpos longiflorus*/*Balsamorhiza sagittata* community is found. It occurs on soils with a 25-inch mollic epipedon over and in conjunction with a weak fine subangular blocky, gravelly silt loam cambic horizon and lime mottles within 25 inches of the soil surface. This community is probably a seral representative of a *Pinus monophylla*/*Cercocarpus ledifolius*/*Symphoricarpos longiflorus*/*Festuca idahoensis* habitat-type.

The *Pinus monophylla*/*Juniperus osteosperma* community occurs in the eastern part of the watershed on south and west facing slopes of 14 to 30 percent. It is found on soils with a 6- to 8-inch ochric epipedon over a moderate medium subangular blocky, gravelly clay loam argillic horizon and lithic contact within 17 inches of the soil surface; a 6- to 13-inch mollic epipedon over a massive gravelly silty clay loam cambic horizon and with an indurated duripan within 16 to 22 inches of the surface; a 4- to 10-inch mollic epipedon over a strong fine subangular blocky, gravelly clay argillic horizon and lithic contact within 9 to 18 inches of the soil surface; and a 6- to 12-inch mollic epipedon over and in conjunction with a moderate fine subangular blocky, gravelly sandy clay loam argillic horizon and lithic contact within 14 to 19 inches of the soil surface. This community is a *Pinus monophylla*/*Juniperus osteosperma* habitat-type.

The *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula*/*Poa secunda* community has developed in the eastern part of the watershed on north and northeast facing slopes of 6 to 37 percent. It occurs on soils with a 12-inch mollic epipedon over slate, and a 6- to 12-inch mollic epipedon over and in conjunction with a moderate fine subangular blocky, gravelly sandy clay loam argillic horizon and lithic contact within 14 to 19 inches of the soil surface. This community is probably a seral representative of a *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula*/*Stipa lettermani* habitat-type.

In the eastern part of the watershed on south and west facing slopes of 14 to 38 percent the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*/*Bromus tectorum* community is found. It occurs on soils with a 4- to 8-inch ochric epipedon over a moderate fine subangular blocky, gravelly light clay argillic horizon and lithic contact within 16 to 18 inches of the soil surface, and a 10-inch mollic epipedon over a moderate fine subangular blocky, very gravelly heavy clay loam argillic horizon. This community is probably a seral representative of a *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*/*Agropyron spicatum* habitat-type.

Climaxes:

Climax as used in this report is defined as the kind of community capable of perpetuation under the prevailing climatic, edaphic, physiographic, biotic or pyric condition. This definition is in accordance with the polyclimax concept where several climaxes constitute the vegetation in an area as the result of succession.

Climatic climax develops on land (moderately rolling to level) that is neither excessively nor inadequately drained, so that the major environmental conditions affecting organisms are climatic. Physiographic is determined in large measure by the nature of the topography (land relief). Edaphic climax is determined largely by the nature of the soil. A physiographic edaphic climax is determined mostly by both topography and soils. A biotic climax is determined by the incidence and maintenance of a decisive "biotic factor" such as the continuous heavy grazing by animals (Hanson, 1962).

Most of the communities in the watersheds have been affected by grazing use and areas of relatively undisturbed vegetation are not common. Consequently a majority of the communities are biotic climaxes. For this reason an estimate of the climax of each community was based on their present condition and probable habitat-type (Table 35).

RECREATION

The watershed is not located close to a populated area. At the present time this remoteness makes the basin of little value for recreational development. The main recreational attraction is in hunting mule deer and sagegrouse. When recreation pressure warrants, the watershed does have some excellent areas where camping and picnic sites could be developed.

Table 35. Type of climaxes associated with the probable habitat-type and present communities in the Coils Creek Watershed.

Probable Habitat-type and Present Community		Type of Climax									
		: :Climatic:	: :Physio- :graphic:	: :Edaphic:	: :Biotic:	: :Physio- :graphic:	: :Edaphic:	: :Biotic:	: :Physio- :graphic:	: :Edaphic:	: :Biotic:
A. ^a ^b	<i>Artemisia arbuscula</i> / <i>Festuca idahoensis</i>	:	:	:	:	:	:	:	:	X	:
B. ^a ^b	<i>Artemisia arbuscula</i> / <i>Stipa thurberiana</i>	:	:	:	:	:	X	:	:	:	:
	<i>A. arbuscula</i> / <i>Poa secunda</i>	:	:	:	:	:	:	:	:	:	X
C. ^a ^b	<i>Artemisia tridentata</i> / <i>Agropyron spicatum</i>	:	:	:	:	:	:	:	:	X	:
	<i>A. tridentata</i> / <i>Poa secunda</i> / <i>Balsamorhiza sagittata</i>	:	:	:	:	:	:	:	:	:	X
D. ^a ^b	<i>Artemisia tridentata</i> / <i>Stipa thurberiana</i>	:	:	:	:	:	:	:	:	:	:
	<i>A. tridentata</i> / <i>Poa secunda</i> / <i>Phlox diffusa</i>	:	X	:	:	:	:	:	:	:	*
E. ^a ^b	<i>Artemisia tridentata</i> / <i>Stipa lettermani</i>	:	:	:	:	:	:	:	:	X	:
	<i>A. tridentata</i> / <i>Chrysothamnus viscidiflorus</i> / <i>Sitanion hystrix</i>	:	:	:	:	:	:	:	:	:	X
	<i>A. tridentata</i> / <i>C. viscidiflorus</i> / <i>P. secunda</i> / <i>Wyethia mollis</i>	:	:	:	:	:	:	:	:	:	X
F. ^a ^b	<i>Juniperus osteosperma</i> / <i>A. tridentata</i> / <i>Agropyron spicatum</i>	:	:	:	:	:	:	:	:	X	:
	<i>J. osteosperma</i> / <i>A. tridentata</i> / <i>Poa secunda</i>	:	:	:	:	:	:	:	:	:	X
G. ^a ^b	<i>Pinus monophylla</i> / <i>A. tridentata</i> / <i>A. spicatum</i>	:	:	:	:	:	:	:	:	:	X
	<i>P. monophylla</i> / <i>A. tridentata</i> / <i>Poa secunda</i>	:	:	:	:	:	:	:	:	:	X
H. ^a ^b	<i>Pinus monophylla</i> / <i>Cercocarpus ledifolius</i> / <i>Symphoricarpos</i>	:	:	:	:	:	:	:	:	:	:
	<i>longiflorus</i> / <i>Festuca idahoensis</i>	:	:	:	:	:	X	:	:	:	:
	<i>P. monophylla</i> / <i>C. ledifolius</i> / <i>S. longiflorus</i> / <i>B. sagittata</i>	:	:	:	:	:	:	:	:	:	X
I. ^a ^b	<i>Pinus monophylla</i> / <i>Juniperus osteosperma</i>	:	:	:	:	:	:	:	:	X	:
J. ^a	<i>Pinus monophylla</i> / <i>Juniperus osteosperma</i> / <i>Artemisia</i>	:	:	:	:	:	:	:	:	X	:
	<i>arbuscula</i> / <i>Stipa lettermani</i>	:	:	:	:	:	:	:	:	:	:

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APPENDIX A.

Precipitation Data for Coils Creek Watershed

Rain Can	Annual Precipitation* (Inches)	Rain Can	Annual Precipitation* (Inches)
1	11.8	10	10.9
2	10.9	11	12.5
3	10.5	12	10.5
4	12.3	13	11.9
5	11.4	14	12.1
6	11.0	15	11.0
7	11.6	16	13.6
8	11.6	17	13.2
9	11.5	18	13.1
		Mean	11.7

Community	Annual Precipitation (Inches)
<i>Artemisia arbuscula/Festuca idahoensis</i>	10.8
<i>Artemisia arbuscula/Poa secunda</i>	11.7
<i>Artemisia tridentata/Chrysothamnus nauseosus/Poa secunda</i>	11.2
<i>A. tridentata/Chrysothamnus viscidiflorus/Poa secunda/ Wyethia mollis</i>	11.2
<i>A. tridentata/C. viscidiflorus/Sitanion hystrix</i>	10.9
<i>A. tridentata/Poa secunda/Balsamorhiza sagittata</i>	13.0
<i>A. tridentata/Poa secunda/Phlox diffusa</i>	11.2
<i>A. tridentata/Amelanchier pallida /Symphoricarpos longiflorus</i>	10.9
<i>Carex sp./Taraxacum officinale</i>	12.1
<i>Juniperus osteosperma/Artemisia tridentata/Poa secunda</i>	11.5
<i>Pinus monophylla/A. tridentata/Poa secunda</i>	12.4
<i>P. monophylla/Cercocarpus ledifolius/S. longiflorus/ Balsamorhiza sagittata</i>	13.2
<i>P. monophylla/Juniperus osteosperma</i>	13.2
<i>P. monophylla/J. osteosperma/Artemisia arbuscula/Poa secunda</i>	13.2
<i>P. monophylla/J. osteosperma/A. tridentata/Bromus tectorum</i>	11.9
<i>S. longiflorus/A. tridentata/B. tectorum/Wyethia mollis</i>	12.0

* Annual precipitation is based on rain cans in or near each community and on 4 consecutive hydrologic years (Oct. 1 to Sept. 30), 1964-1967

APPENDIX B. Soils Families and Sub-groups Associated with
the Coils Creek Watershed Plant Communities.

APPENDIX B-1

Fine-loamy, mixed, frigid family of Mollic Camborthids

Characteristically these soils have an 8-inch ochric epipedon over a massive, light clay loam cambic horizon. Reaction of the solum is neutral.

These soils are usually found at elevations around 6850 feet and are associated with the *Artemisia tridentata/Poa secunda/Phlox diffusa* community. They are found on southwest facing terraces with 1 percent slope. The macrorelief is flat and the microrelief is flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.6 inches. Stoniness class is 0. Majority of the roots are found within 15 inches of the soil surface. There is slight sheet erosion.

- | | | |
|------|--------|---|
| A11 | 0-3" | Pale brown (10YR6/3) light clay loam, brown (10YR4/4) moist; moderate fine platy; slightly hard, friable, sticky, plastic; organic matter 2.0 percent, conductivity 0.2 mmhos., cation exchange capacity 21.0 meq.; noneffervescent; neutral (pH 7.0); vesicular pores; abrupt smooth boundary. |
| A12 | 3-8" | Light yellowish brown (10YR6/4) light clay loam, brown (10YR4/3) moist; weak fine subangular blocky; soft, very friable, sticky, plastic; plentiful very fine and plentiful fine roots; noneffervescent; clear smooth boundary. |
| B2 | 8-15" | Pale brown (10YR6/3) light clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine, and fine medium roots; organic matter 0.9 percent, conductivity 0.3 mmhos.; noneffervescent; neutral (pH 7.2); abrupt smooth boundary. |
| 11C1 | 15-28" | Light yellowish brown (10YR6/4) very gravelly sandy loam, dark brown (7.5YR4/2) moist; single grain; soft, friable, nonsticky, nonplastic; plentiful very fine and plentiful fine roots; strongly effervescent; lime accumulation on gravel. |

Loamy-skeletal, mixed, frigid family of Mollic Camborthids

Typically these soils have a 10-inch ochric epipedon over a massive, very gravelly sandy clay loam cambic horizon and lime mottles within 19 inches of the surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 6800 feet and are associated with the *Pinus monophylla*/*Artemisia tridentata*/*Poa secunda* community. They occur on northwest facing slopes of 22 percent. The macrorelief is mountainous and the microrelief is uniform concave. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.1 inches. Stoniness class is 0. The majority of the roots are within 19 inches of the soil surface. There is slight to moderate rill and sheet erosion.

- A 11 0-2" Grayish brown (10YR5/2) gravelly sandy clay loam, very dark grayish brown (10YR3/2) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots, organic matter 2.2 percent, conductivity 0.3 mmhos., cation exchange capacity 22.0 meq.; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.
- A12 2-10" Brown (10YR5/3) gravelly sandy clay loam, brown (10YR4/3) moist; weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; noneffervescent; clear smooth boundary.
- B2* 10-19" Pale brown (10YR6/3) very gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; massive, slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine, plentiful fine, plentiful medium and plentiful coarse roots; very slightly effervescent; clear smooth boundary.
- Clca 19-28"+ Pale brown (10YR6/3) very gravelly sandy clay loam, light yellowish brown (10YR4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine, plentiful fine, and few medium roots; strongly effervescent; lime mottles.

* Soils Laboratory data missing.

Clayey-skeletal, mixed, frigid family of Mollic Haplargids

Characteristically these soils have a 5-inch ochric epipedon over a moderate fine subangular blocky, gravelly light clay argillic horizon and lime mottles within 17 inches of the soil surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 7000 feet and are associated with the *Pinus monophylla*/*Artemisia tridentata*/*Poa secunda* community. They occur on west facing slopes of 25 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.5 inches. Stoniness class is 1. The majority of the roots are found within 17 inches of the soil surface. There is slight to no sheet erosion.

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|------|---------|--|
| A1 | 0-5" | Grayish brown (10YR5/2) gravelly sandy clay loam, very dark grayish brown (10YR3/3) moist; weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; organic matter 2.7 percent, conductivity 0.4 mmhos., cation exchange capacity 24.8 meq.; very slightly effervescent; neutral (pH 7.2); abrupt smooth boundary. |
| B2t | 5-12" | Dark grayish brown (10YR4/2) moist; gravelly light clay; moderate fine subangular blocky; hard, firm, very sticky, very plastic; abundant very fine, abundant fine, plentiful medium and few coarse roots; organic matter 2.3 percent, conductivity 0.3 mmhos., slightly effervescent; neutral (pH 7.2); clay films; clear smooth boundary. |
| B3 | 12-17" | Yellowish brown (10YR5/4) moist; very gravelly light clay loam; massive; slightly hard, friable, sticky, slightly plastic; plentiful very fine and plentiful fine roots; violently effervescent; clear smooth boundary. |
| Clca | 17-22"+ | Yellowish brown (10YR5/6) moist; very gravelly sandy clay loam; massive; hard, firm, slightly sticky, slightly plastic; few very fine, few fine and few medium roots; violently effervescent; lime mottles. |

Fine, mixed, frigid family of Mollic Haplargids

Characteristically these soils have a 3-inch ochric epipedon over a moderate medium subangular blocky, clay loam argillic horizon. Reaction of the solum is slightly acid.

These soils are usually found at elevations around 7100 feet and are associated with the *Artemisia tridentata*/*Poa secunda*/*Phlox diffusa* community. They occur on east facing terraces with 4 percent slope. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 5.7 inches. Stoniness class is 0. The majority of the roots are within 20 inches of the soil surface. There is very slight to no erosion.

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|-----|--------|--|
| A1 | 0-3" | Pale brown (10YR6/3) fine sandy loam, dark yellowish brown (10YR3/4) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; organic matter 1.5 percent, conductivity 0.2 mmhos., cation exchange capacity 22.3 meq.; noneffervescent; slightly acid (pH 6.5); vesicular pores; abrupt smooth boundary. |
| B1 | 3-9" | Pale brown (10YR6/3) clay loam, brown (10YR4/3) moist; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; abundant very fine and abundant fine roots; noneffervescent; clear smooth boundary. |
| B2t | 9-30" | Light brown (7.5YR6/4) heavy clay, brown (7.5YR4/4) moist; strong medium subangular blocky; extremely hard, extremely firm, very sticky, very plastic; few very fine, plentiful fine and few medium roots; organic matter 1.5 percent, conductivity 0.4 mmhos.; noneffervescent; slightly acid (pH 6.5); clay films; gradual smooth boundary. |
| B3 | 30-34" | Pink (7.5YR7/4) gravelly light clay, brown (7.5YR5/4) moist; moderate medium subangular blocky; hard, firm, very sticky, very plastic; few fine roots; noneffervescent. |

Fine, mixed, frigid, shallow family of Mollic Haplargids

Characteristically these soils have a 4-inch ochric epipedon over a strong fine platy, gravelly clay loam argillic horizon and paralithic contact within 8 inches of the soil surface. Reaction of the solum is neutral.

These soils are usually found at elevations around 7100 feet and are associated with the *Artemisia arbuscula/Poa secunda* community. They occur on southeast facing slopes of 7 percent. The macro-relief is hilly and the microrelief is uniform concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.2 inches. Stoniness class is 1. The majority of the roots are found within 8 inches of the soil surface. There is slight erosion.

- | | | |
|-----|------|--|
| A1 | 0-4" | Light brownish gray (10YR6/2) gravelly sandy clay loam, dark brown (10YR3/3) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; organic matter 0.6 percent, conductivity 4.2 mmhos., cation exchange capacity 17.8 meq.; noneffervescent; neutral (pH 7.1); vesicular pores; abrupt smooth boundary. |
| B2t | 4-8" | Brown (10YR5/3) gravelly clay loam, dark yellowish brown (10YR4/4) moist; strong fine platy; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine and few medium roots; organic matter 0.7 percent, conductivity 0.2 mmhos.; noneffervescent; neutral (pH 6.9); abrupt irregular boundary. |
| R1 | 8"+ | Paralithic contact with sandstone. |

Clayey-skeletal, mixed, frigid family of Lithic Mollic Haplargids

Typically these soils have a 4- to 8-inch ochric epipedon over a moderate fine subangular blocky, gravelly light clay argillic horizon and lithic contact within 16 to 18 inches of the soil surface. The reaction of the solum is neutral.

These soils are usually found at elevations around 7500 feet and are associated with the *Artemisia arbuscula*/*Poa secunda* and *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*/*Bromus tectorum* communities. They are usually found on west facing slopes of 8 to 14 percent. The macrorelief is hilly and the microrelief is uniform convex or uniform concave. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.9 to 2.2 inches. Stoniness class is 1. The majority of the roots are within 13 inches of the soil surface. There is slight to no sheet and rill erosion.

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|------|--------|--|
| A1 | 0-8" | Pale brown (10YR6/3) gravelly sandy clay loam, brown (10YR4/3) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 1.8 percent, conductivity 0.2 mmhos., cation exchange capacity 17.1 meq.; noneffervescent; neutral (pH 6.9); vesicular pores; abrupt smooth boundary. |
| B21t | 8-13" | Light yellowish brown (10YR6/4) gravelly light clay, dark yellowish brown (10YR4/3) moist; moderate fine subangular blocky; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine and few medium roots; organic matter 1.5 percent, conductivity 0.2 mmhos., noneffervescent; neutral (pH 6.9); clear smooth boundary. |
| B22t | 13-18" | Yellowish brown (10YR5/4) very gravelly clay, dark yellowish brown (10YR3/4) moist; strong fine subangular blocky; hard, firm, very sticky, very plastic; few very fine and few fine roots; noneffervescent; clay films; abrupt irregular boundary. |
| R1 | 18"+ | Lithic contact with slate. |

Loamy-skeletal, mixed, frigid family of Lithic Mollic
Haplargids

Characteristically these soils have a 6- to 8-inch ochric epipedon over a moderate medium subangular blocky, gravelly clay loam argillic horizon and lithic contact within 17 inches of the soil surface. The reaction of the solum is neutral.

These soils are usually found at elevations from 6800 to 7200 feet and are associated with the *Artemisia tridentata*/*Poa secunda*/*Balsamorhiza sagittata* and *Pinus monophylla*/*Juniperus osteosperma* communities. They are found on northwest and west facing slopes of 1 to 24 percent. The macrorelief is mountainous or hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.7 to 1.9 inches. Stoniness class is 0 to 3. The majority of the roots are found within 12 inches of the soil surface. There is slight to moderate sheet and rill erosion.

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|-----|--------|---|
| A1 | 0-6" | Pale brown (10YR6/3) gravelly loam, dark brown (10YR3/3) moist; moderate fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 2.6 percent, conductivity 0.4 mmhos., cation exchange capacity 22.7 meq.; noneffervescent; neutral (pH 7.1); clear smooth boundary. |
| B2t | 6-12" | Light yellowish brown (10YR6/4) gravelly clay loam, dark yellowish brown (10YR3/4) moist; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine, plentiful medium and few coarse roots; organic matter 2.1 percent, conductivity 0.2 mmhos., noneffervescent; clay films; neutral (pH 6.7); abrupt smooth boundary. |
| B3 | 12-17" | Dark yellowish brown (10YR4/4) moist; very gravelly clay loam; moderate medium subangular blocky, soft, very friable, sticky, plastic; few very fine and few fine roots; noneffervescent; abrupt smooth boundary. |
| R1 | 17"+ | Lithic contact with slate. |

Very fine, montmorillonitic, frigid family of Mollic
Paleic Durargids

Characteristically these soils have a 7- to 9-inch ochric epipedon over a strong medium prismatic, heavy clay argillic horizon and an indurated duripan within 23 to 28 inches of the surface. Reaction of the solum is slightly acid to neutral.

These soils are usually found at elevations from 7200 to 7500 feet and are associated with the *Artemisia arbuscula*/*Poa secunda* and *Artemisia tridentata*/*Poa secunda*/*Phlox diffusa* communities. They are found on east facing terraces with 1 to 4 percent slope. The macrorelief is rolling or flat and the microrelief is uniform convex or uniform flat. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.8 to 4.8 inches. Stoniness class is 0. The majority of the roots are within 17 inches of the soil surface. There is slight to no erosion.

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|---------|--------|--|
| All | 0-4" | Pale brown (10YR6/3) fine sandy loam, dark brown (10YR3/3) moist; strong fine platy; slightly hard, friable, nonsticky, nonplastic; plentiful very fine and plentiful fine roots; organic matter 1.1 percent, conductivity 0.5 mmhos., cation exchange capacity 15.6 meq.; noneffervescent; slightly acid (pH 6.4); vesicular pores; abrupt smooth boundary. |
| A12 | 4-9" | Pale brown (10YR6/3) clay loam, dark yellowish brown (10YR3/4) moist; moderate fine platy; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine and plentiful medium roots; noneffervescent; abrupt smooth boundary. |
| B21t | 9-17" | Dark brown (7.5YR4/4) moist; heavy clay; strong medium prismatic; extremely hard, extremely firm, very sticky, very plastic; plentiful very fine, plentiful fine, and plentiful medium roots; organic matter 1.4 percent, conductivity 6.5 mmhos.; noneffervescent; neutral (pH 7.3); pressure faces; clear smooth boundary. |
| B22t | 17-22" | Reddish brown (5YR4/4) moist; heavy clay; strong medium prismatic; extremely hard, extremely firm, very sticky, very plastic; few very fine and few fine roots; non-effervescent; pressure faces; clear smooth boundary. |
| B3ca | 22-28" | Reddish brown (5YR4/4) moist; gravelly clay loam; massive; hard, firm, very sticky, very plastic; few fine roots; strongly effervescent; abrupt smooth boundary. |
| C1casim | 28"+ | Indurated duripan. |

Fine-loamy, mixed, frigid family of Fluventic Haploquolls

Characteristically these soils have a 14-inch mollic epipedon over a weak medium prismatic, silty clay Cl horizon and mottles in the lower part of the epipedon. Reaction of the solum is slightly acid. This soil has recently been gullied and drained.

These soils are usually found at elevations around 7300 feet and are associated with the *Artemisia tridentata/Poa secunda/Iva axillaris* community. They occur on southeast facing drainage bottoms with 2 percent slope. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 6.7 inches. Stoniness class is 0. The majority of the roots are within 27 inches of the soil surface. There is very slight sheet and rill erosion, with vast gully erosion.

- | | | |
|-------|--------|---|
| A11 | 0-4" | Grayish brown (10YR5/2) silt loam, black (10YR2/1) moist; moderate fine platy; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 1.9 percent, conductivity 0.2 mmhos., cation exchange capacity 22.0 meq.; noneffervescent; slightly acid (pH 6.4); abrupt smooth boundary. |
| A12 | 4-14" | Gray (10YR5/1) silty clay, very dark brown (10YR2/2) moist; moderate fine subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine, plentiful fine, few medium and few coarse roots; noneffervescent; clear smooth boundary; very few mottles. |
| Cl | 14-27" | Light gray (10YR6/1) silty clay, brown (10YR4/4) moist; weak medium prismatic; hard, firm, sticky, plastic; plentiful very fine, plentiful fine and few medium roots; noneffervescent; mottles; abrupt smooth boundary. |
| 11C2 | 27-30" | Pale brown (10YR6/3) clay, brown (10YR4/3) moist; massive; extremely hard, extremely firm, very sticky, very plastic; few fine and few medium roots; noneffervescent; mottles; abrupt smooth boundary. |
| 111C3 | 30-36" | Very pale brown (10YR7/3) very gravelly clay loam, brown (10YR4/3) moist; massive; hard, firm, sticky, plastic; few fine and few medium roots; noneffervescent; mottles; abrupt smooth boundary. |
| 1VC4 | 36-40" | Yellowish brown (10YR5/4) clay, olive brown (2.5YR4/4) moist; strong medium subangular blocky; extremely hard, extremely firm, very sticky, very plastic; noneffervescent; mottles; abrupt smooth boundary. |

Fine-silty, mixed, frigid family of Cumulic Haplaquolls

Characteristically these soils have a 30-inch mollic epipedon over a massive, silty clay IIC2 horizon and mottles in the lower epipedon. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 6900 feet and are associated with the *Carex* sp./*Taraxacum officinale* community. They occur on east and west facing drainage bottoms with 2 percent slope. The macrorelief is flat and microrelief is uniform flat. These soils belong to the B hydrologic group and have a profile available water holding capacity of 6.9 inches. Stoniness class is 0. The majority of the roots are found within 26 inches of the soil surface. Slight to no sheet and rill erosion but some meadows have been gullied.

- | | | |
|------|---------|--|
| All | 0-2" | Very dark grayish brown (10YR3/2) silt loam, black (10YR2/1) moist; strong fine platy; hard, friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 3.5 percent, conductivity 1.4 mmhos., cation exchange capacity 39.9 meq.; noneffervescent; neutral (pH 7.3); abrupt smooth boundary. |
| A12 | 2-8" | Very dark grayish brown (10YR3/2) silt loam, black (10YR2/1) moist; massive; hard, friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; noneffervescent; abrupt smooth boundary. |
| IIC1 | 8-30" | Dark grayish brown (10YR4/2) silty clay, very dark brown (10YR2/2) moist; moderate fine subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine, plentiful fine, and plentiful medium roots; noneffervescent; mottles; gradual smooth boundary. |
| IIC2 | 30-38"+ | Very dark brown (10YR2/2) dark grayish brown (10YR4/2) moist; silty clay loam; massive; slightly hard, friable, sticky, plastic; plentiful very fine, and plentiful fine roots; noneffervescent; mottles. |

Loamy-skeletal, mixed, frigid family of Fluventic
Haplustolls

These soils typically have an 11-inch mollic epipedon over a massive, gravelly sandy loam 11C1 horizon. Reaction of the surface horizon is medium acid.

These soils are usually found at elevations around 6900 feet and are associated with the *Artemisia tridentata*/*Chrysothamnus nauseosus*/*Poa secunda* community. They occur on southeast facing drainage bottoms with 1 percent slope. Macrorelief is flat and the microrelief is uniform flat. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.1 inches. Stoniness class is 0. The majority of the roots are within 19 inches of the soil surface. There is slight rill erosion and the community has been gullied and drained.

- Al 0-11" Grayish brown (10YR5/2) very fine sandy loam, very dark grayish brown (10YR3/2) moist; slightly hard, soft, nonsticky, nonplastic; abundant very fine, abundant fine roots; organic matter 2.5 percent, conductivity 0.2 mmhos., cation exchange capacity 21.7 meq.; noneffervescent; medium acid (pH 5.8); abrupt smooth boundary.
- 11C1 11-19" Pale brown (10YR6/3) gravelly sandy loam, dark brown (10YR3/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; plentiful very fine, plentiful fine roots; noneffervescent; abrupt smooth boundary.
- 11C2 19-30"+ Brown (7.5YR4/2) moist; very gravelly sand; massive; soft, very friable, nonsticky, nonplastic; few very fine and few fine roots; noneffervescent.

APPENDIX B-12

Coarse-loamy, mixed, frigid family of Fluventic Haplustolls

These soils characteristically have an 11-inch mollic epipedon over a weak medium subangular blocky, silt loam cambic horizon. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 7100 feet and are associated with the *Artemisia tridentata*/*Chrysothamnus nauseosus*/*Poa secunda* community. They are found on west facing fans with 1 percent slope. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.7 inches. Stoniness class is 0. The majority of the roots are found within 20 inches of the soil surface. There is slight to no sheet erosion. A fairly large gully running through the community has drained this soil.

- A11 0-3" Grayish brown (10YR5/2) gravelly silt loam, very dark grayish brown (10YR3/2) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 2.0 percent, conductivity 0.2 mmhos., cation exchange capacity 22.2 meq.; noneffervescent; neutral (pH 6.9); abrupt smooth boundary.
- A12 3-11" Grayish brown (10YR5/2) gravelly silt loam, dark brown (10YR3/3) moist; weak medium subangular blocky; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; noneffervescent; clear smooth boundary.
- B2 11-]1" Pale brown (10YR6/3) gravelly silt loam, dark brown (10YR3/3) moist; weak medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and plentiful medium roots; organic matter 0.9 percent, conductivity 0.6 mmhos.; noneffervescent; neutral (pH 7.2); abrupt smooth boundary.
- 11C1 21-31" Very pale brown (10YR7/4) gravelly sandy clay loam, dark yellowish brown (10YR7/4) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine and few fine roots; noneffervescent; abrupt smooth boundary.
- 11C2 31-36"+ Pale brown (10YR6/3) gravelly sandy clay loam, dark yellowish brown (10YR4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; few fine roots; violently effervescent on bottom of gravel.

Coarse-loamy, mixed, frigid family of Calcic
Pachic Haploxerolls

Typically these soils have a 25-inch mollic epipedon over and in conjunction with a weak fine subangular blocky, gravelly silt loam cambic horizon and lime mottles within 25 inches of the soil surface. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 7100 feet and are associated with the *Pinus monophylla/Cercocarpus ledifolius/Symphoricarpos longiflorus/Balsamorhiza sagittata* community. They occur on northwest facing slopes of 35 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 5.7 inches. Stoniness class is 3. Majority of the roots occur within 23 inches of the soil surface. There is slight sheet and rill erosion.

- A1 0-10" Grayish brown (10YR5/2) gravelly silt loam, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; organic matter 6.5 percent, conductivity 0.4 mmhos., cation exchange capacity 34.5 meq.; slightly effervescent; neutral (pH 6.8); clear smooth boundary.
- B2 10-25" Brown (10YR5/3) gravelly silt loam, dark brown (10YR3/3) moist; weak fine subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, abundant medium and few coarse roots; organic matter 3.3 percent, conductivity 0.3 mmhos.; strongly effervescent; neutral (pH 7.0); clear smooth boundary.
- Clca 25-36"+ Yellowish brown (10YR5/4) gravelly silty loam, dark yellowish brown (10YR3/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine and plentiful fine roots; violently effervescent; lime mottles.

Loamy-skeletal, mixed, frigid family of Entic Haploxerolls

Characteristically these soils have a 17- to 18-inch mollic epipedon over a massive, gravelly sandy clay loam C1 horizon. Reaction of the surface horizon is slightly acid.

These soils are usually found at elevations from 7500 to 8300 feet and are associated with the *Artemisia tridentata*/*Poa secunda*/*Balsamorhiza sagittata*, *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Poa secunda*/*Wyethia mollis* and *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Sitanion hystrix* communities. They are usually found on northeast, east and south facing slopes of 32 to 34 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 2.1 to 2.7 inches. Stoniness class is 0 to 2. The majority of the roots are within 23 inches of the soil surface. There is slight to no sheet and rill erosion.

- | | | |
|-----|---------|--|
| A11 | 0-4" | Grayish brown (10YR5/2) fine sandy loam, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; organic matter 4.2 percent, conductivity 0.2 mmhos., cation exchange capacity 20.9 meq.; noneffervescent; slightly acid (pH 6.2); abrupt smooth boundary. |
| A12 | 4-10" | Grayish brown (10YR5/2) gravelly sandy clay loam, very dark grayish brown (10YR3/2) moist; weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; noneffervescent; clear smooth boundary. |
| A13 | 10-17" | Brown (10YR5/3) gravelly sandy clay loam, dark brown (10YR3/3) moist; moderate fine granular; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine, plentiful fine and few medium roots; noneffervescent; clear smooth boundary. |
| C1 | 17-24" | Light yellowish brown (10YR6/4) gravelly sandy clay loam, dark yellowish brown (10YR3/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine, plentiful fine, and few medium roots; noneffervescent; clear smooth boundary. |
| C2 | 24-32"+ | Pale brown (10YR6/3) gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine, few fine and few medium roots; noneffervescent. |

Loamy-skeletal, mixed, frigid family of Lithic
Haploxerolls

These soils characteristically have a 7-inch mollic epipedon over a massive, very gravelly sandy clay loam C1 horizon and lithic contact within 20 inches of the surface. Reaction of the surface horizon is neutral.

These soils are usually found at elevations from 7700 to 8100 feet and are associated with the *Artemisia arbuscula/Festuca idahoensis* community. They are usually found on north and northeast facing slopes of 21 to 28 percent. The macrorelief is mountainous and the micro-relief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.9 inches. Stoniness class is 2. The majority of the roots are within 19 inches of the soil surface. There is slight to no erosion.

- | | | |
|-----|-------|--|
| All | 0-2" | Grayish brown (10YR5/2) very gravelly sandy loam, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; few very fine and few fine roots; organic matter 2.4 percent, conductivity 0.3 mmhos., cation exchange capacity 25.6 meq.; noneffervescent; neutral (pH 6.7); vesicular pores; abrupt smooth boundary. |
| A12 | 2-7" | Grayish brown (10YR5/2) very gravelly sandy clay loam, very dark grayish brown (10YR3/2) moist; weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, and few medium roots; noneffervescent; clear smooth boundary. |
| C1 | 7-20" | Yellowish brown (10YR5/4) very gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; noneffervescent; abrupt irregular boundary. |
| R1 | 20"+ | Lithic contact with basalt. |

Loamy-skeletal, mixed, frigid, shallow family of
Lithic Haploxerolls

Characteristically these soils have a 12-inch mollic epipedon over slate. Reaction of the surface horizon is neutral.

These soils are usually found at elevations around 7300 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula*/*Poa secunda* community. They are found on north-east facing slopes of 6 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.1 inches. Stoniness class is 2. Majority of the roots are found within 12 inches of the soil surface. There is slight to moderate sheet erosion.

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|----|-------|--|
| Al | 0-2" | Very dark grayish brown (10YR3/2) moist; gravelly sandy loam; massive; loose, loose, nonsticky, nonplastic; organic matter 1.0 percent, conductivity 0.2 mmhos., cation exchange capacity 18.8 meq.; noneffervescent; neutral (pH 7.2); gradual smooth boundary. |
| Cl | 2-12" | Dark brown (10YR3/3) moist; gravelly sandy loam, massive; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine, abundant medium and few coarse roots; noneffervescent; abrupt smooth boundary. |
| Rl | 12"+ | Lithic contact with slate. |

Loamy-skeletal, mixed, frigid family of Haplic Durixerolls

Typically these soils have a 6- to 13-inch mollic epipedon over a massive, gravelly silty clay loam cambic horizon and an indurated duripan within 16 to 22 inches of the surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations from 6800 to 7300 feet and are associated with the *Juniperus osteosperma*/*Artemisia tridentata*/*Poa secunda* and *Pinus monophylla*/*Juniperus osteosperma* communities. They occur on northwest and west facing slopes of 6 to 14 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.8 to 2.7 inches. Stoniness class is 0 to 3. Majority of the roots are found within 13 inches of the soil surface. There is slight rill and sheet erosion.

- | | | |
|-----|------------|--|
| All | 0-4" | Grayish brown (10YR5/2) gravelly silty clay loam, dark brown (10YR3/3) moist; weak fine platy; soft, very friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; organic matter 2.2 percent, conductivity 0.2 mmhos., cation exchange capacity 29.8 meq.; slightly effervescent; neutral (pH 7.2); vesicular pores; abrupt smooth boundary. |
| A12 | 4-13" | Grayish brown (10YR5/2) gravelly silty clay loam, dark brown (10YR3/3) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, and plentiful medium roots; strongly effervescent; clear smooth boundary. |
| B2 | 13-22" | Pale brown (10YR6/3) gravelly silty clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine and few fine roots; organic matter 2.0 percent, conductivity 0.5 mmhos.; violently effervescent; mildly alkaline (pH 7.6); abrupt smooth boundary. |
| C1c | casim 22"+ | Indurated duripan. |

Clayey-skeletal, mixed, frigid family of Typic
Argixerolls

These soils characteristically have a 10-inch mollic epipedon over a moderate fine subangular blocky, very gravelly heavy clay loam argillic horizon. Reaction of the soil increases with depth and ranges from slightly acid to mildly alkaline.

These soils are usually found at elevations from 6800 to 7400 feet and are associated with the *Artemisia tridentata*/*Chrysothamnus viscidiflorus*/*Poa secunda*/*Wyethia mollis*, *Pinus monophylla*/*Artemisia tridentata*/*Poa secunda* and *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia tridentata*/*Bromus tectorum* communities. They occur on northwest, east and south facing slopes of 11 to 38 percent. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.8 to 4.2 inches. Stoniness class is 0 to 3. The majority of the roots are within 12 inches of the soil surface. There is slight to no erosion.

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|------|---------|--|
| A1 | 0-3 | Grayish brown (10YR5/2) gravelly sandy clay loam, very dark grayish brown (10YR3/2) moist; moderate very fine platy; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 4.6 percent, conductivity 0.3 mmhos., cation exchange capacity 20.5 meq.; noneffervescent; slightly acid (pH 6.4); vesicular pores; abrupt smooth boundary. |
| A3 | 3-10" | Brown (10YR5/3) gravelly light sandy clay, dark brown (7.5YR3/2) moist; weak fine granular; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine and few medium roots; noneffervescent; clear smooth boundary. |
| B2lt | 10-15" | Light yellowish brown (10YR6/4) very gravelly heavy clay loam, dark yellowish brown (10YR3/4) moist; moderate fine subangular blocky; hard, firm, sticky, plastic; plentiful very fine and plentiful fine roots; organic matter 4.5 percent, conductivity 0.6 mmhcs.; noneffervescent; neutral (pH 6.7); clear smooth boundary. |
| B2t | 15-23" | Light yellowish brown (10YR6/4) gravelly heavy clay loam, dark yellowish brown (10YR4/4) moist; massive; hard, firm, sticky, plastic; few fine roots; noneffervescent; abrupt smooth boundary. |
| C1 | 23-32"+ | Light yellowish brown (10YR6/4) very gravelly sandy loam, dark yellowish brown (10YR4/4) moist; single grain; soft, friable, nonsticky, nonplastic; noneffervescent. |

Fine, mixed, frigid family of Lithic Argixerolls

Typically these soils have a 12-inch mollic epipedon over and in conjunction with a strong fine subangular blocky, light clay argillic horizon and lithic contact within 12 inches of the surface. Reaction of the solum is slightly acid.

These soils are usually found at elevations around 7700 feet and are associated with the *Artemisia tridentata*/*Amelanchier pallida*/*Symphoricarpos longiflorus* community. They occur on east facing slopes of 12 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.2 inches. Stoniness class is 4. The majority of the roots are within 12 inches of the soil surface. There is slight sheet erosion.

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|-----|-------|--|
| A1 | 0-5" | Grayish brown (10YR5/2) clay loam, very dark grayish brown (10YR3/2) moist; weak medium subangular blocky; soft, very friable, sticky, plastic; abundant very fine, abundant fine and few medium roots; organic matter 4.7 percent, conductivity 0.2 mmhos., cation exchange capacity 27.0 meq.; noneffervescent; slightly acid (pH 6.5); clear smooth boundary. |
| B2t | 5-12" | Brown (10YR5/3) gravelly light clay, dark brown (10YR3/3) moist; strong fine subangular blocky; hard, firm, very sticky, very plastic; plentiful very fine and plentiful fine and few medium roots; organic matter 4.0 percent, conductivity 0.4 mmhos.; noneffervescent; slightly acid (pH 6.5); clay films; abrupt irregular boundary. |
| R1 | 12" | Lithic contact with basalt. |

Clayey-skeletal, mixed, frigid family of Lithic Argixerolls

These soils typically have a 4- to 10-inch mollic epipedon over a strong fine subangular blocky, gravelly clay argillic horizon and lithic contact with 9 to 18 inches of the soil surface. Reaction of the solum decreases with depth and ranges from neutral to slightly acid.

These soils are usually found at elevations from 6600 to 8000 feet and are associated with the *Artemisia tridentata*/*Poa secunda*/*Balsamorhiza sagittata*, *Artemisia tridentata*/*Amelanchier pallida*/*Symphoricarpos longiflorus*, *Juniperus osteosperma*/*Artemisia tridentata*/*Poa secunda* and *Pinus monophylla*/*Juniperus osteosperma* communities. They are found on all aspects with 6 to 38 percent slope. The macro-relief is hilly and mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.0 to 2.2 inches. Stoniness class is 2 to 4. The majority of the roots are found with 8 to 14 inches of the soil surface. There is slight to no sheet erosion.

- | | | |
|------|--------|---|
| A1 | 0-6" | Brown (10YR5/3) gravelly clay loam, dark brown (10YR3/3) moist; moderate fine platy; slightly hard, friable, sticky, plastic; plentiful very fine and plentiful fine roots; organic matter 2.8 percent, conductivity 0.3 mmhos., cation exchange capacity 30.1 meq.; noneffervescent; neutral (pH 6.6); clear smooth boundary; upper 2 inches has vesicular pores. |
| B21t | 6-14" | Yellowish brown (10YR5/4) gravelly clay, dark yellowish brown (10YR4/4) moist; strong fine subangular blocky; hard, firm, very sticky, very plastic; abundant very fine, abundant fine, plentiful medium and few coarse roots; organic matter 1.6 percent, conductivity 0.4 mmhos.; noneffervescent; slightly acid (pH 6.4); clay films; abrupt irregular boundary. |
| B22t | 14-16" | Reddish brown (5YR4/4) moist; very gravelly clay; massive; extremely hard, extremely firm, very sticky, very plastic; few fine, few medium and few coarse roots; noneffervescent; clay films; abrupt irregular boundary. |
| R1 | 16"+ | Lithic contact with slate. |

Loamy-skeletal, mixed, frigid family of Lithic
Argixerolls

Characteristically these soils have a 6- to 12-inch mollic epipedon over and in conjunction with a moderate fine subangular blocky, gravelly sandy clay loam argillic horizon and lithic contact within 14 to 19 inches of the soil surface. Reaction of the solum is neutral.

These soils are usually found at elevations from 7000 to 7050 feet and are associated with the *Pinus monophylla*/*Juniperus osteosperma* and *Pinus monophylla*/*Juniperus osteosperma*/*Artemisia arbuscula*/*Poa secunda* communities. They occur on north and south facing slopes of 24 to 37 percent. The macrorelief is hilly and mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 1.4 to 2.1 inches. Stoniness class is 2 to 3. The majority of the roots are within 13 inches of the soil surface. There is slight to moderate sheet and rill erosion.

- | | | |
|-----|--------|--|
| A11 | 0-2" | Light brownish gray (10YR6/2) gravelly loamy sand, very dark grayish brown (10YR3/2) moist; weak fine platy; soft, very friable, nonsticky, nonplastic; organic matter 2.2 percent, conductivity 0.2 mmhos., cation exchange capacity 2.3 meq.; noneffervescent; neutral (pH 6.6); vesicular pores; abrupt smooth boundary. |
| A12 | 2-7" | Grayish brown (10YR5/2) gravelly loamy sand, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine, plentiful fine, and few medium roots; noneffervescent; clear smooth boundary. |
| B1 | 7-12" | Grayish brown (10YR5/2) gravelly light sandy clay loam, dark brown (10YR3/3) moist; moderate fine subangular blocky; slightly hard, friable, slightly sticky, nonplastic; abundant very fine, abundant fine and plentiful medium roots; organic matter 1.2 percent, conductivity 0.3 mmhos.; noneffervescent; neutral (pH 6.7); clear smooth boundary. |
| B2t | 12-19" | Brown (10YR4/3) moist; gravelly clay loam; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine and plentiful medium roots; noneffervescent; clear smooth boundary. |
| R1 | 19"+ | Lithic contact with slate. |

Loamy-skeletal, mixed, frigid family of Typic
Argixerolls

Typically these soils have a 10-inch mollic epipedon over a moderate fine subangular blocky, very gravelly clay loam argillic horizon. Reaction of the solum is slightly acid.

These soils are usually found at elevations around 7350 feet and are associated with the *Symphoricarpos longiflorus*/*Artemisia tridentata*/*Bromus tectorum*/*Wyethia mollis* community. They are found on north facing drainage bottoms with 9 percent slope. The macro-relief is undulating and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.3 inches. Stoniness class is 0. The majority of the roots are found within 19 inches of the soil surface. There is slight to no sheet erosion.

- | | | |
|-----|--------|---|
| A1 | 0-10" | Grayish brown (10YR5/2) gravelly sandy clay loam, very dark grayish brown (10YR3/2) moist; weak fine platy; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 3.9 percent, conductivity 0.2 mmhos., cation exchange capacity 21.7 meq.; noneffervescent; slightly acid (pH 6.1); abrupt smooth boundary. |
| B2t | 10-19" | Yellowish brown (10YR5/4) very gravelly clay loam, dark yellowish brown (10YR3/4) moist; moderate fine subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine, plentiful fine, few medium and few coarse roots; organic matter 2.1 percent, conductivity 0.4 mmhos., noneffervescent; slightly acid (pH 6.1); clay films, clear smooth boundary. |
| B3 | 19-40" | Yellowish brown (10YR5/4) very gravelly clay loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable, sticky, plastic; few very fine, few fine and few medium roots; noneffervescent. |

APPENDIX C VEGETATION AND SOILS ASSOCIATION TABLE FOR THE COILS CREEK WATERSHED

[illegible]

COILS CREEK WATERSHED

VEGETATION MAPPING UNITS AND PRECIPITATION, STREAMFLOW RECORDING STATIONS

SCALE 1:31680

1 .5 0 1 2 Miles

PRECIPITATION AND STREAMFLOW RECORDING STATIONS

LEGEND

- Stream Flow Recorder
- ▲ Peak Flow Gauge
- Rain Can
- Precipitation Recorder

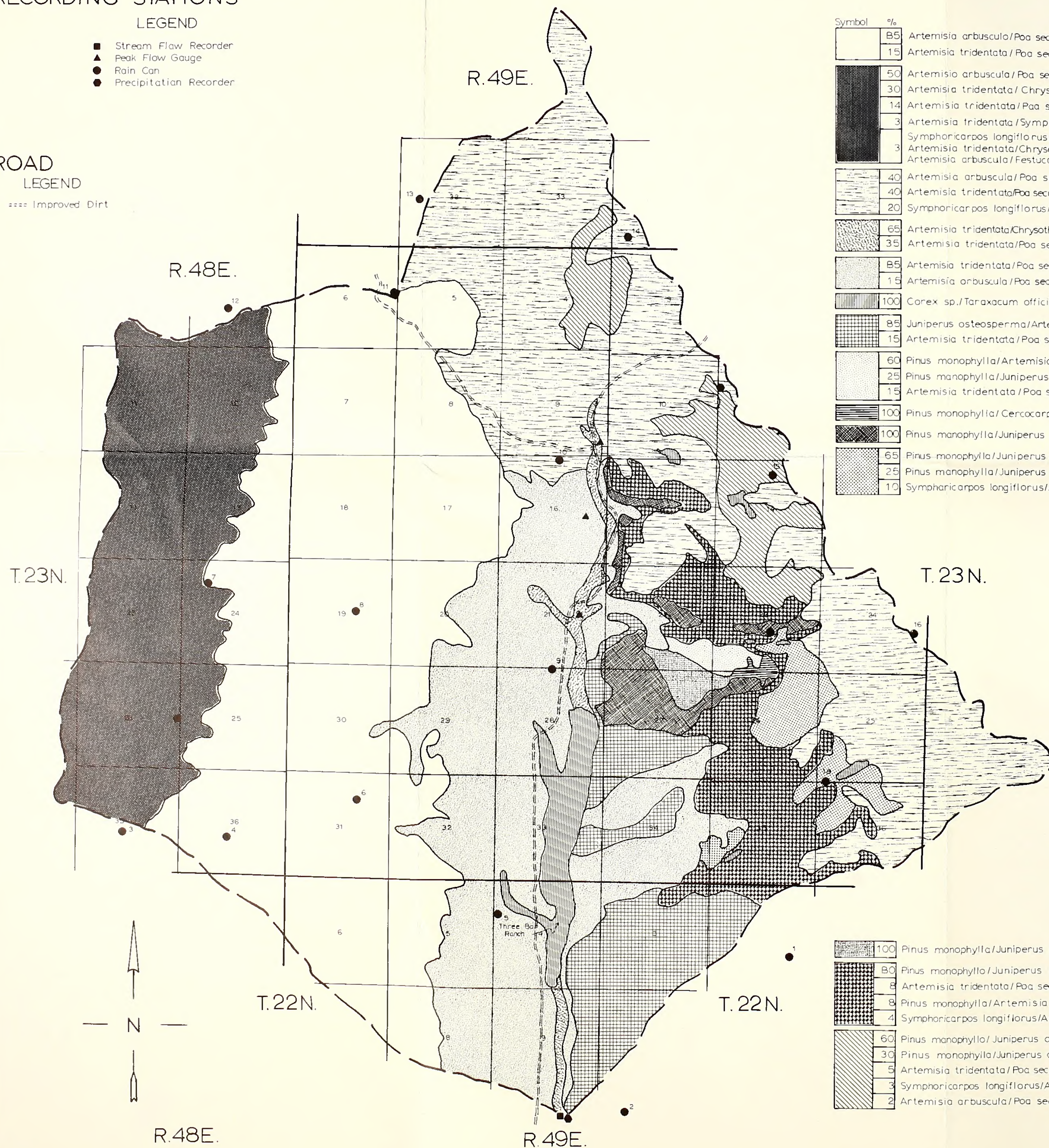
ROAD

LEGEND

--- Improved Dirt

VEGETATION MAPPING UNITS LEGEND

Symbol	%	
■	85	Artemisia arbuscula/Poa secunda
■	15	Artemisia tridentata/Poa secunda/Phlox diffusa
■	50	Artemisia arbuscula/Poa secunda
■	30	Artemisia tridentata/Chrysothamnus viscidiflorus/Sitanion hystrix
■	14	Artemisia tridentata/Poa secunda/Balsamorhiza sagittata
■	3	Artemisia tridentata/Symphoricarpos longiflorus/Amelanchier pallida
■	3	Symphoricarpos longiflorus/Artemisia tridentata/Bromus tectorum/Wyethia mollis
■	3	Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda/Wyethia mollis
■		Artemisia arbuscula/Festuca idahoensis
■	40	Artemisia arbuscula/Poa secunda
■	40	Artemisia tridentata/Poa secunda/Balsamorhiza sagittata
■	20	Symphoricarpos longiflorus/Artemisia tridentata/Bromus tectorum/Wyethia mollis
■	65	Artemisia tridentata/Chrysothamnus nauseosus/Poa secunda
■	35	Artemisia tridentata/Poa secunda/Iva axillaris
■	85	Artemisia tridentata/Poa secunda/Phlox diffusa
■	15	Artemisia arbuscula/Poa secunda
■	100	Corex sp./Taraxacum officinale
■	85	Juniperus osteosperma/Artemisia tridentata/Poa secunda
■	15	Artemisia tridentata/Poa secunda/Phlox diffusa
■	60	Pinus monophylla/Artemisia tridentata/Poa secunda
■	25	Pinus monophylla/Juniperus osteosperma/Artemisia arbuscula/Poa secunda
■	15	Artemisia tridentata/Poa secunda/Balsamorhiza sagittata
■	100	Pinus monophylla/Cercocarpus ledifolius/Symphoricarpos longiflorus/Balsamorhiza sagittata
■	100	Pinus monophylla/Juniperus osteosperma
■	65	Pinus monophylla/Juniperus osteosperma/Artemisia arbuscula/Poa secunda
■	25	Pinus monophylla/Juniperus osteosperma/Artemisia tridentata/Bromus tectorum
■	10	Symphoricarpos longiflorus/Artemisia tridentata/Bromus tectorum/Wyethia mollis



■	100	Pinus monophylla/Juniperus osteosperma/Artemisia tridentata/Bromus tectorum
■	80	Pinus monophylla/Juniperus osteosperma/Artemisia tridentata/Bromus tectorum
■	8	Artemisia tridentata/Poa secunda/Balsamorhiza sagittata
■	8	Pinus monophylla/Artemisia tridentata/Poa secunda
■	4	Symphoricarpos longiflorus/Artemisia tridentata/Bromus tectorum/Wyethia mollis
■	60	Pinus monophylla/Juniperus osteosperma/Artemisia tridentata/Bromus tectorum
■	30	Pinus monophylla/Juniperus osteosperma/Artemisia arbuscula/Poa secunda
■	5	Artemisia tridentata/Poa secunda/Balsamorhiza sagittata
■	3	Symphoricarpos longiflorus/Artemisia tridentata/Bromus tectorum/Wyethia mollis
■	2	Artemisia arbuscula/Poa secunda

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